The Canadian Medical Association Journal

Editor

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Published by

THE CANADIAN MEDICAL ASSOCIATION

1940

The Canadian Medical Association Journal

Vol. 42 TORONTO, JANUARY, 1940 No. 1

FOREWORD

AN APPEAL TO THE PROFESSION

ON January 1st, 1940, the annual fee for membership in the Association becomes due and payable for the ensuing year. As part of the plan of Federation, it is the duty of each Division in the Association to collect our annual fee from those eligible practitioners in the province who desire to be members of the Canadian Medical Association. Accordingly, the nine Divisions shortly will be approaching members, and we are confident that it will be the desire of every present member of the Association to pay the fee when called upon to do so.

We would like to think that our membership in 1940 will be greatly increased, indeed, to the point of including every one of the 8,228 doctors who, in signing questionnaires in respect to military matters, saw fit to trust the C.M.A. to represent them.

We will no doubt be excused for repeating what has been said on former occasions, namely, that, when war was evident, the C.M.A. offered its services to the Government of Canada in any capacity coming within our scope. Our offer was accepted and Central and Divisional Advisory Committees have been set up throughout the country, organized to give immediate co-operation to the military authorities in respect to all medical matters which may arise. To be able to give intelligent advice, it became necessary to ask the profession for relevant information by way of questionnaires, approximately 10,000 of which were sent out. It is rather remarkable, we think that, at this writing we are able to report that 8,228 completed questionnaires have been returned to the Association's office. What other body in Canada was there to represent the medical profession at this time? Need we say more about the proof, to which we have so often referred, of the value and advantage which can accrue to a nationally organized medical profession such as the Canadian Medical Association and to each individual member. Is it not time that Canada should include in its national medical association every eligible medical practitioner in the land? Is this too much to hope for? Probably it is; but surely there can be no sound reason why several thousand doctors in this country still find it inconvenient or unnecessary to be members of our Association.

Each of the nine Divisions not only proposes to collect the annual fee from present members but also to make an earnest endeavour to bring in new members. May we cordially invite the active co-operation and support of every present member in the Association in the campaign which we trust will be so productive in the next few months as to make the C.M.A. in 1940 infinitely stronger than it has ever been before.

DEMONSTRATION OF AN ORALLY ACTIVE MEDULLOTROPHIC PRINCIPLE IN A PRIMARY EXTRACT OF PITUITARY TISSUE*

BY J. B. COLLIP

Montreal

HYPOPHYSECTOMY results, among other things, in atrophy of the gonads, the thyroid, and the cortex of the adrenal gland. No atrophic changes in the adrenal medulla have been reported following hypophysectomy, and it has been the general consensus that this tissue is not under pituitary control.[1] Anselmino, Herold and Hoffmann[2] did claim, however, that there is an anterior lobe principle which is trophic to the medulla.

This preliminary report is made for the purpose of recording certain observations which suggest very strongly that the pituitary gland does contain a hormone substance which has a specific effect on one type of cell of the adrenal medulla. This effect has been obtained consistently in a small number of experiments on rats in which it has been administered orally.

The events leading up to this observation are somewhat unusual in laboratory experience, and may be of interest. The writer, as a result of certain clinical observations, became convinced some time ago that a certain pituitary extract had an effect when administered orally. (In making this statement I fully realize that certain clinicians have had such a conviction for many years). Repeated attempts in the laboratory, over a period of years, to obtain conclusive proof of the oral activity of any of the anterior lobe hormones have resulted in failure. Feeling, therefore, that for the time being the human individual would serve best as the experimental animal, a number of my clinical associates very kindly co-operated in testing certain extracts by oral administration. Some of the clinical results were so striking that there seemed little doubt that the treatment given had been the direct cause of the beneficial effects observed, particularly since a placebo was substituted in several instances and in every such case it was reported as ineffective. The tentative hypothesis was then made that the clinical effects might possibly be explained by stimulation of the adrenal cortex. Since the extracts used contained some corticotrophic hormone, as shown by injection into hypophysectomized rats, this seemed to be justifiable. Feeding as well as injection experiments were again undertaken with the extract which appeared to be effective in certain human subjects, for the purpose of determining its action, if any, upon the adrenals of hypophysectomized animals. When the treated animals were killed, the thyroids, gonads, and adrenals were prepared for microscopic study. Sections of these organs were examined by Dr. Hans Selye and they were freely intermingled with many similar sections of organs from other rats, both normal and hypophysectomized, which had been treated with a variety of extracts or with nothing at all. Dr. Selye, at the time of his diagnosis, had no knowledge of the treatment of the animals from which the sections which he was examining had been derived. A typical example of the medullary reaction which was obtained in each of 3 hypophysectomized animals which had been fed the active extract for 16 days is shown in Fig. 1. For comparison a section of normal medulla of a hypophysectomized rat treated by injection with a corticotrophic preparation is shown in Fig. 2. This reaction has been observed in 4 other hypophysectomized rats treated by injection for 8 days. It was negative in still 3 other animals fed for only 5 days. Additional 10 positive reactions have been obtained with other pituitary preparations, 6 by feeding and 4 by injection. No thyrotrophic, gonadotrophic, or growth effects have been noted with the medullotrophic extract following either oral or subcutaneous administration. Dr. Selye's histological report is as follows.

"The adrenal medulla of the animals submitted for diagnosis contains unusually large non-vacuolized amphophilic cells with particular affinity for eosin. Such elements are usually referred to as the "dark cells" of the medulla, and their presence is not unusual, nor is their number considerably in excess of what one finds in normal adrenals. Their size, and especially the development of their cytoplasm, on the other hand, is much greater than I ever remember to have seen, either in the medulla of normal rats or of those treated with various hormone preparations. This change was often associated with marked cortical atrophy in hypophysectomized animals.

* From the Department of Biochemistry, McGill University.

"These cells differ significantly from those described by Hoffmann and Anselmino following treatment with their 'medullotrophic preparation' in so far as the cells described by the latter investigators were heavily vacuolized."

In a recent publication[3] I described the method of fractionation of pituitary extracts which I had found to be most suitable. The primary alcohol extract described therein was stated to be without known physiological properties, but an indication was given that this fraction was being further investigated. It is this primary extract which has formed the basis for the present study. The positive results obtained in preliminary experiments have opened up a number of new lines of investigation which are now being vigorously pursued. Some of these consist in (1) the further purification of the active extract; (2) the effects of prolonged administration of it; (3) a comparison of the relative merits of oral as against parenteral administration at similar dosage levels; and (4) the possible therapeutic value of the medullotrophic fraction. Under this latter heading the question of dosage will be very important. Up to the present, extract equivalent to from 1 to 3 grams of fresh gland tissue has been administered daily to human subjects, but much larger doses have been well tolerated and have produced no untoward effects.

A matter of prime importance would seem to be in relation to the type of gland material used and of its handling. An 83 per cent alcoholic extract of prime pituitary tissue quickly prepared and concentrated and kept at low temperature until used has given the best results in my limited experience. Whole glands of cattle have been used for the most part, but the anterior lobe is presumably the source of the active substance.

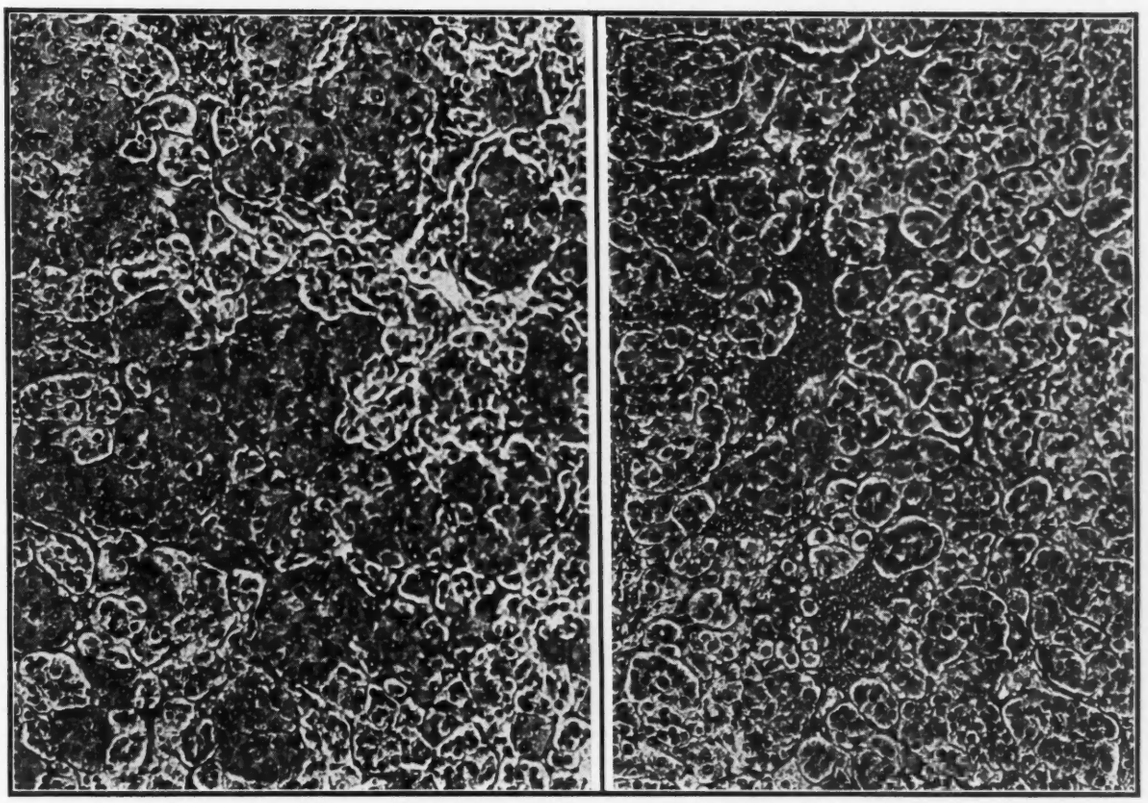

Fig. 1.—Adrenal medulla of a hypophysectomized rat fed 1 to 2 c.c. of a medullotrophic extract daily for 16 days and showing greatly enlarged hypertrophic "dark cells" and normal light cells. Cortex atrophic. **Fig. 2.**—Normal adrenal medulla of a hypophysectomized rat treated by injection with a corticotrophic preparation for 9 days, showing light and dark cells, both of which are of equal size. Cortex normal.

There is as yet no purely physiological test in an animal for this medullotrophic pituitary principle. Since the clinical observations do not in the least suggest that there is an effect upon the chromaffin system it is possible that the medulla has another function in addition to the production of adrenalin and that this might be subserved by the so-called "dark cells".

The relationship, if any, between certain clinical effects obtained with extracts containing the

medullotrophic substance and this active principle remains to be determined.

SUMMARY

A principle has been demonstrated in primary high alcoholic extracts of pituitary glands which has a trophic effect upon the so-called "dark cells" of the adrenal medulla of hypophysectomized rats.

For rendering invaluable aid in the carrying out of this preliminary study I wish to thank most heartily Drs. C. K. McLeod, A. D. Campbell, H. Mortimer, G. E. Reed and R. P. Wright, of Montreal, Dr. R. G. Hoskins, of Boston; and Dr. Hans Selye, of Montreal, for the histological report. Also I wish to acknowledge the technical assistance of Mr. A. A. Long and Mrs. K. Nielsen, and to thank Mr. K. Nielsen for preparing the photomicrographs.

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CHRONIC RECURRENT ULCERATION OF THE LEG

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CHRONIC recurrent ulceration of the leg is an outward manifestation of a lesion involving the extra-fascial tissues. Its incidence and the indifferent results obtained by casual treatment have led to an acknowledged and marked economic waste. It is proposed to present a definite and comprehensive method of caring for this somewhat neglected condition, which, while not curing, as absolute cure of this lesion is impossible, gives comfort to the patient whilst at the same time it allows the individual to return to a normal sphere of usefulness.

ETIOLOGY

Recurrent ulceration of the leg, as considered in this paper, is a result of the presence of varicose veins. The dilated, lengthened veins, with their inefficient valves, interfere with the venous return from the leg. Blood flow in these veins is in a downward direction. Venous blood thus is poured into the deep veins of the leg through the perforating veins. This blood travels up to the thigh where some of it spills over into the internal saphenous, and so back down the leg.

Normally the valves in the perforating veins allow blood to pass in one direction only—from superficial to deep.[7] Failure of these valves further favours stasis of venous blood in the area usually drained by the perforating veins. Since the usual vein in the leg to become varicose is the long saphenous, the area which suffers most lies on the inner side of the lower half of the leg. And it is in precisely this area that varicose ulcers are commonest.

The second factor in the production of the lesion is infection. The organisms may be blood-borne, but more commonly are introduced through a break in the skin. The inefficient venous return interferes with the normal working of the defenses against infection. Healing is slow and much scar is formed.

It has been shown that the pressure in varicose veins is increased greatly.[5] It has been demonstrated also that a rise in venous pressure results in a greater flow of lymph.[2] Therefore in a leg where veins are varicose an increase in lymph-flow occurs. This increase will take place entirely superficially to the deep fascia since no communication exists between the superficial and deep sets of lymphatics in the leg.[1] Scarring will interfere with this flow of lymph, forcing accumulation distal to the scar. This fluid acts as an excellent tissue culture medium, and it has been shown that the fibroblast is the first fixed tissue cell to respond.[2] These new fibroblasts produce tissue which, as it gets older, contracts, and thus a vicious circle is developed which steadily produces scarring in the subcutaneous tissues of the leg. Hence a lesion is produced which constantly, albeit slowly, develops a band of scar about and along the involved leg external to the deep fascia. This encircling band of thickening can be felt and seen in any longstanding case. The tissue just below the knee may be of normal softness on palpation, but on sliding the hand downwards a rather abrupt transition to firm wooden stiffness in the subcutaneous tissues becomes apparent.

A healed ulcer is covered with atrophic epithelium. Such a covering can be abraded by slight trauma, resulting in a portal of entry for further infective agents. Thus another factor is added to the list of those responsible for recurrent ulceration. These various factors—varicose veins, infection, lymphstasis, production of scar, trauma, and the thin covering of healed areas—result in chronic recurrent ulceration of the leg. Together they produce a slowly progressive lesion in the subcutaneous tissues of the leg which is evidenced by pigmentation, œdema, scarring, and repeated ulceration.

PATHOLOGY

As noted above, chronic recurrent ulcers occur chiefly on the medial surface of the lower third of the leg. If present for any length of time the margins are pigmented and œdematous, the edges heaped up with yellowish-brown keratin, the surface covered with pale granulation tissue interposed between bits of slough, the discharge moderate, thin, often of a foul odour, and the base fixed.

Microscopical examination of a healed area shows a greatly thinned epithelium, overlying which may be a layer of keratin. Interspersed among the epidermal cells numerous large vacuolated cells containing deeply stained nuclei may be noted. Occasionally the cells of the basal layer contain a brownish pigment. Hair follicles, sweat glands, and papillæ are absent. The corium is greatly fibrosed. Focal and diffuse infiltration of lymphocytes is present, the former occurring particularly about blood vessels. A moderate degree of œdema is a constant finding.

The subcutaneous tissues show marked fibrosis, lymphocytic infiltration, and œdema. Capillaries are thickened and numerous, frequently being found in groups suggesting telangiectasis. Both veins and arteries showed marked sclerosis. Indeed this reaction in the blood vessels of the region is an outstanding feature of the lesion. Hæmosiderin is found in varying amounts. Some areas in the subcutaneous tissues show evidence of fat necrosis. Associated with such necrosis are giant cells of the foreign-body type. Nerves in the subcutaneous tissues are involved in the process. Sections of the internal saphenous nerve from cases operated upon show chronic degenerative changes, *viz.*, intraneural and perineural fibrosis, vacuolization, irregular swelling, and fragmentation of the myelin sheath. Finally, fibrous thickening and œdema of the deep fascia are to be seen. Deep to this structure it is rare to find any pathological change, probably because of the lack of lymphatic communication between the superficial and deep lymphatic fields. Occasionally some unusual feature is found. A type of "flowing osteomyelitis" or periostitis has been described,[6] and was noted once in this series. Metaplastic bone was found laid down irregularly in the subcutaneous tissues in one case. It was marked about the long saphenous vein. Malignant change was noted once.

The whole picture is thus one of continued chronic inflammation. Vessel changes are marked and result in impoverishment of skin and subcutaneous tissue. Evidence of this is to be found in the occasional areas of fat necrosis. Œdema, the result of obstruction to lymphatic channels and of impaired venous circulation, is to be found in the corium, subcutaneous tissues, and fascia.

BACTERIOLOGY

Smears were taken from many of these ulcers. Staphylococci were found alone in almost one-half the cases examined (48 per cent). The forms, in order of frequency, were *Staph. aureus hæmolyticus, albus,* and *aureus.* A non-hæmolytic streptococcus was present in 24 per cent. Other organisms occasionally found were *B. lactis aerogenes,* and rarely *B. fæcalis alkaligenes, B. fluorescens, B. Welchii, B. sporogenes, B. proteus, B. pyocyaneus,* and *B. alkaligenes.*

Cultures were taken at periods during the time of supportive treatment. Organisms similar to those noted on the first examination were found. This would seem to indicate that there is little or no bactericidal effect from the elastic adhesive bandage or from locking up the discharge, and that a bacteriophage does not develop. These factors have been suggested as playing a part in the good results obtained by use of elastic adhesive therapy. Our results would seem to prove that the improvement obtained is due to the mechanical properties of a properly applied bandage.

NON-OPERATIVE TREATMENT

Many means have been tried in an attempt to give permanent relief to sufferers from this common complaint. In addition to those applied by the medical profession various salves, lotions, etc., have been tried invariably by the patients themselves. The primary fault being circulatory, local applications cannot be expected to

give any lasting relief. Elevation is obviously of value, since venous return is aided. Some type of support to the leg is patently indicated and of course has been tried. One of the most successful forms of support has been Unna's paste. It has, however, the definite defect of being rigid. Elastic support was advocated some years ago by Wright,[8, 9] and forms a very real advance in the treatment of chronic leg ulceration. The support has been used in 100 cases,

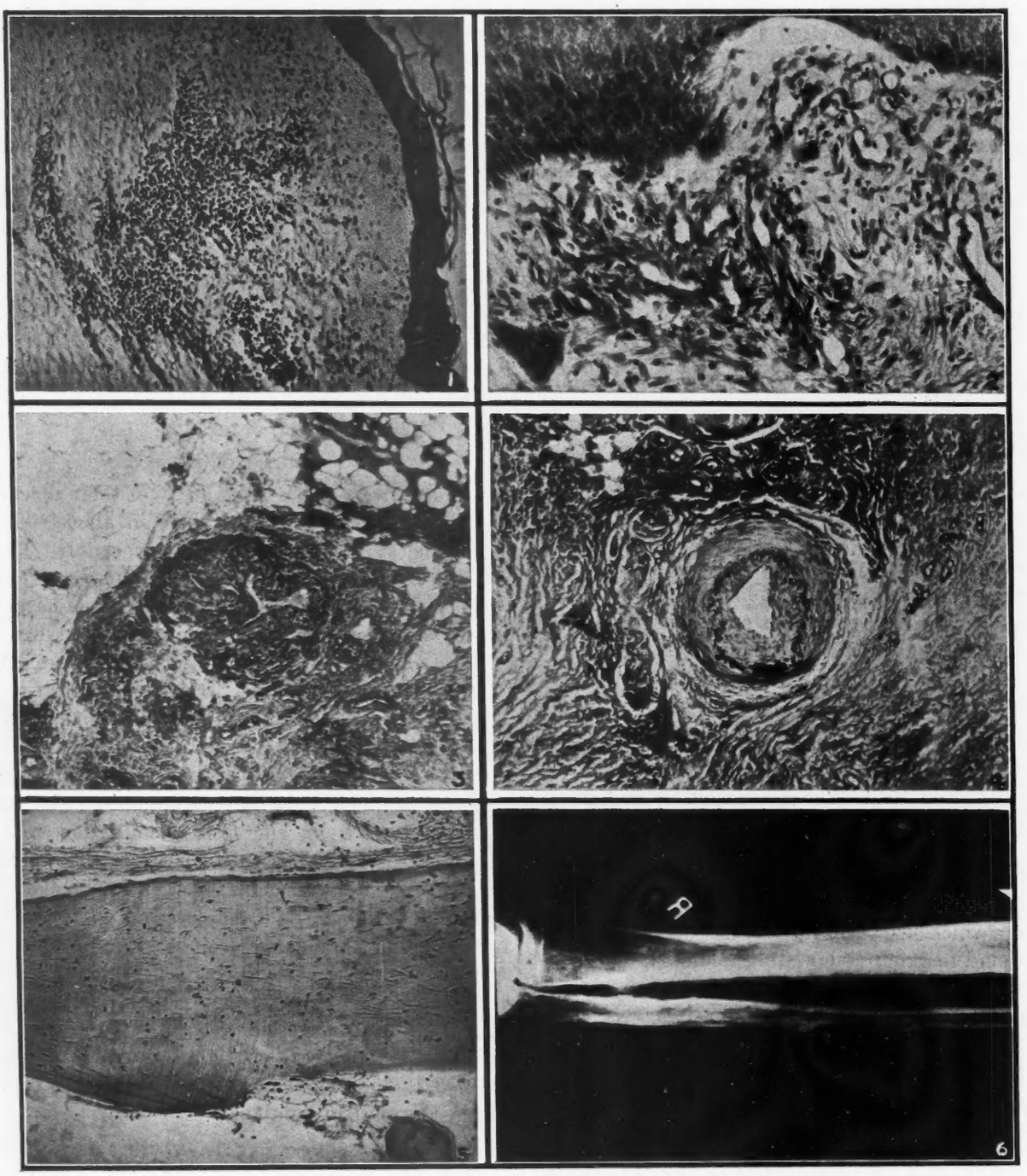

Fig. 1.—The thinned epidermis and thickened corium of a healed ulcer are illustrated. Focal infiltration of lymphocytes is to be seen. The absence of hair follicles and sebaceous glands is characteristic. **Fig. 2.**—A group of new blood vessels are shown underlying the epidermis. Such groups are seen frequently in healed areas. **Fig. 3.**—Sclerosis is a marked feature in the vessels of the involved area. A typical example of phlebosclerosis is pictured. **Fig. 4.**—An example of the arteriolar sclerosis associated with chronic recurrent leg ulceration is shown. **Fig. 5.**—A section of metaplastic bone which formed diffusely in the subcutaneous tissues of a leg, which had been ulcerated for a long time. A similar finding was noted in the other leg. **Fig. 6.**—The changes in bones developing in some cases of recurrent leg ulceration, and described by Morris, are to be seen in this x-ray reproduction. They resemble those changes described by Leri two years later and termed melorrheostosis.

by the author, only three of whom were private patients. The great preponderance of the condition in the poorer part of the population is an old observation.

On admission to the clinic the size of the ulcerated area is noted, blood for Wassermann test taken, culture from the ulcer obtained, and a varicose vein injected. We have been using 5 and 10 per cent sodium morrhuate, and 5 per cent soricin, but have come to the routine use of the latter. The largest vein proximal to the ulcer is injected at the first visit. An elastic adhesive bandage is applied in the manner outlined by Wright, *viz.*, firmly, and with longitudinal strips to prevent cutting by the edges. If the bandage is applied loosely it is not only inefficient but will cause blisters. The patient is instructed to walk as much as possible, to wipe away any discharge, and if for any reason it is decided to remove the bandage, to remove it entirely. Occasionally, in spite of this, a patient will return to the clinic with only the top half of the bandage in place, wondering why the leg and foot are so swollen. Unless the leg is inflamed very acutely the patient is instructed to return in two weeks. At this visit the bandage is removed, another vein is injected, and a new bandage applied. This remains on for one month, when the treatment is repeated if necessary. Once healed, a crêpe bandage is given the patient, who is instructed as to the correct time and method of application, *viz.*, before arising, and firmly from back of the toes to the tibial tubercle. It is removed at bed-time.

Fig. 7.—The method of applying an elastic adhesive bandage is illustrated. Longitudinal strips minimize the pressure of the edges of the bandage on the skin. A wedge of sponge rubber is shown in position, over the ulcer, in the middle picture. It is incorporated in the bandage in order that pressure may be brought directly on the surface of the ulcer, which lies below skin level.

Injections are continued, of course, until the varicose veins are eliminated. If the enlargement of the long saphenous vein extends on to the thigh the vein should be ligated at the foramen ovale as a preliminary to further treatment.

Of the 100 cases so treated (99 with negative Wassermann test), 31 were males, 69 females. The average age of the former was 55, of the latter 59. Sixty-nine were healed and have remained so; 8 were not controlled by the elastic adhesive bandage; and 15 have recurred. Sensitivity to elastoplast was noted in seven cases, being very marked in one. Twenty cases had punched out ulcers, necessitating the use of rubber pads over the lesions in order that pressure might be applied to their surfaces. Five of the 15 recurrent cases have since been operated upon.

Only one patient with a positive Wassermann was treated. She was eighty years of age and had huge bilateral ulcers. These were reduced to approximately one-half their size by specific therapy. The residual ulcers have healed slowly under elastic adhesive therapy.

Those patients sensitive to the bandage are treated with Unna's paste support until healed. This is applied preferably early in the day before the leg swells. Applying the elastic adhesive bandage, sticky side out, was attempted in some of these but did not prove to be an efficient procedure. Following healing a crêpe bandage is worn as in the other group.

OPERATIVE TREATMENT

Sympathectomy. — Following Hunter and Royle's suggestion of interrupting the sympathetic pathway in the treatment of spastic paraplegia it was noted that the circulation in limbs of patients so treated improved. As a result, operations on the sympathetic chain were

done in an attempt to relieve many varied conditions. Since impairment of circulation is present in recurrent leg ulceration it was not long before the operation was advocated for the treatment of this lesion.

Ten such cases were operated upon. Prompt healing followed. Nine recurred in less than one year, and the tenth remained healed for nearly three years. These results are not any better than those obtained from bed rest and antiseptic dressings—the old method of treatment. Accordingly, it is our feeling that lumbar sympathectomy has no place in the treatment of this lesion. Division of the internal saphenous nerve produces a local and transitory sympathetic effect. Such a procedure will speed the healing of an ulcer, besides eliminating pain, and is, therefore, often of value.

Venous circulation can be improved by injection and ligation. As already mentioned, enlargement of the long saphenous vein on the thigh necessitates ligation of the vein just before its entrance into the femoral. The distal portion may be injected with benefit at the time of ligation. Lymphatic stasis can be lessened, often markedly, by removal of a strip of deep fascia. If swelling is a marked feature this should be done on both sides of the leg, otherwise on the inner side only. The poor covering of healed areas can, after excision, be replaced by a thick Thiersch graft.

The operation we have been doing for the past six years is that suggested by Homans,[3, 4] and is based on the conception of ulcers outlined above. An incision is made down the inner side of the leg. It divides to include the area of previous ulceration, the incision marking out this area preferably, for technical reasons, branching from the longitudinal incision at right angles. A strip of fascia about one and one-half inches wide is removed down to the portion to be excised, at which point everything down to and including the deep fascia is removed. This excised tissue includes the internal saphenous vein and nerve. The removal of the latter, while it is inevitable, aids not only in making the patient more comfortable after operation but also produces a vaso-dilation distal to the division and should aid therefore in healing. The in-

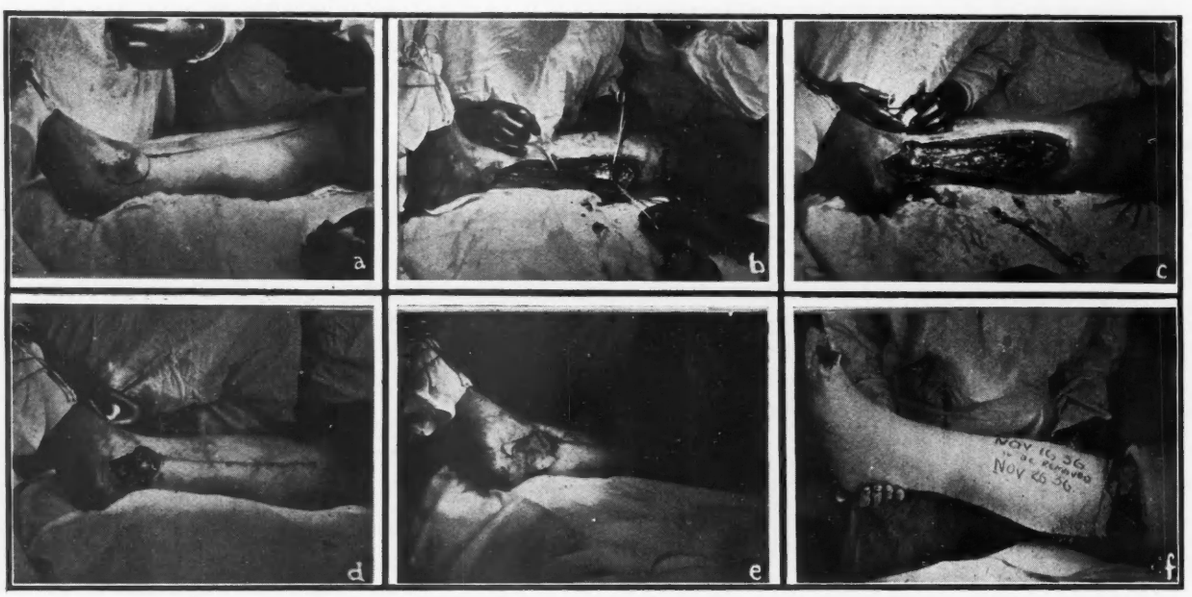

Fig. 8.—Various steps in the operative treatment are shown. First the incision is illustrated, next the skin flaps are turned back and the excision of the strip of fascia started. Over the fascia lies the long saphenous vein and nerves. The third picture shows the defect left after excision. The last three illustrate the incision closed, the graft in place, and finally the plaster of Paris splint over the dressing, respectively.

Operative intervention is never attempted until the ulcer is healed. This is accomplished by bed rest, elevation of the affected limb, suitable dressings, and, if necessary, pinch-grafting. Danger of post-operative infection is reduced to a minimum by this measure and deep scarring thus prevented. Such scarring, it is felt, would jeopardize the eventual satisfactory result that should follow radical operation. Surgical treatment, to be of lasting benefit, must be directed at eliminating, or lessening to the greatest possible extent the effect of the various factors responsible for the recurrent ulceration.

cision is closed down to the area of excision, and this is covered with a thick Thiersch graft cut from one or other thigh. A much neater operation, and with less loss of blood, can be done if a tourniquet is used. It is our custom to apply over the firm dressing of gauze and flannelette bandage a light plaster of Paris splint to prevent movement. Dressings are removed in ten days and the stitches taken out. If there has not been an entire "take" of the graft, the patient is kept in hospital until healing is complete. Following discharge from hospital the patient wears a crêpe bandage during the day for at least three months, longer if possible. Not only does this aid in restoring efficient circulation, but it also affords some protection against trauma.

Fig. 9.—A post-operative specimen from a recurrent leg ulcer is depicted. Fascia extends its full length, skin and subcutaneous tissue its distal four inches. **Fig. 10.**—This female, aged 54, was operated upon in 1934. The right leg has remained healed and comfortable to date. The left leg developed a small ulcer over the tibia in 1935, and was treated by swinging in a pedicle graft from the outer side of the leg. Neither of these legs has swollen since. Fascia was removed from both sides of each leg.

Thirty patients have been operated upon by this method. Seven of them were males, with an average age of 40. The average age of the females was 52. Twenty-seven have been free of ulceration since operation, but in some of these sufficient time has not elapsed to list them as clinical cures. All have had complete relief from aching and pain. Two have been free of œdema, the remainder still swelling somewhat, but in not one case to the degree present prior to operation. The period of hospitalization has been long, the average being a little over five weeks. When one considers that the ulcers had been present from four months to thirty-three years (average, six years), this does not seem unduly prolonged.

TABLE I.

AMBULATORY THERAPY

Number treated	100
Males	31
Females	69
Average age (males)	55
" " (females)	59
Healed	69
Recurred	15
Elastic adhesive therapy inefficient	8
Sensitivity to elastic adhesive	7
Positive Wassermann	1

TABLE II.

OPERATIVE THERAPY

Number treated	30
Males	7
Females	23
Average age (males)	40
" " (females)	52
Healed	27

CONCLUSION

The treatment of recurrent ulceration of the leg as described has proved efficient. Based as it is on a more adequate understanding of the underlying causes it affords a better approach to the solution of the problem than has been possible formerly. While it is felt that the lesion, once fully established, can never be completely eradicated, yet the method described offers the unfortunate sufferers relief from symptoms and a return to economic efficiency.

I wish to express my thanks to Prof. W. L. Robinson, of the Department of Pathology, for his aid in the preparation of this paper.

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TRANSVERSE INCISION OF THE ABDOMEN— THE LAPAROTOMY WOUND OF CHOICE

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INTRODUCTION

SINCE modern surgery was first made possible through the brilliant contributions of Joseph Lister and his recognition of the fundamental importance of the discoveries of Pasteur, the abdomen has been opened for purposes of exploration and operation in the great majority of cases, and by most surgeons by means of a vertical incision. At first such openings were made in the mid-line—*linea alba*—and to a considerable extent such incisions are still employed, more especially below the umbilicus for operations upon the pelvic organs. For many years, however, it has been recognized that firm healing of this aponeurotic tissue is necessarily slow, that such a wound is subjected to very considerable lateral pull* and that consequently a prolonged post-operative period of bed rest is required. It has, moreover, long been recognized that in too large a proportion of cases abdominal wall weakness or even frank hernia has ensued. Even more important is, I believe, the pain and interference with function which arise from adhesion of abdominal viscera to the deep surface of such a wound.

The major disadvantage of the vertical incision — no matter how fashioned — is that the aponeurotic structures are cut across the direction of their strong fibres—that is at right angles to the line of greatest strain. The lesser disadvantage is that there is great risk in those incisions which either split or displace the rectus muscle that three or more intercostal nerves may be damaged or destroyed.

The main advantage of the vertical incision is that, whatever method is employed, the incision is easily and quickly made and that there is relatively little bleeding, since the incision lies parallel to the greater part of the blood supply. Such an incision is, moreover, easily increased in length either upward or downward towards diaphragm or pelvis, as the exigencies of the case may demand.

In all cases, therefore, in which the diagnosis of an acute abdominal crisis demanding surgical interference is made, but in which it is not possible to establish an exact pre-operative diagnosis as to the site of the viscus primarily involved, the employment of a vertical incision, made to one or other side of the umbilicus, will suffice to establish the direction in which the incision must be enlarged in order to obtain direct access to the organ. Under these conditions a vertical incision is, therefore, recommended.

In this contribution it is not my intention to present an anatomical study nor a statistical analysis of cases but rather to indicate certain technical features regarding the fashioning of a transverse incision which has been eminently successful in my hands.

The author has employed transverse incisions for opening the abdomen in an increasingly large proportion of cases since 1916. At that time, while working at No. 22 Casualty Clearing Station with the British Army in France, there passed through my hands a large number of gunshot wounds of the abdomen. Although I was not familiar with the fact that transverse incisions had been previously used or recom-

* Sloan[1] carried out experimental work whereby, by means of spring balances attached to mouse-toothed forceps, he was able to gradually measure the force required to hold the edges of an incision together. He found, *inter alia*, that the longer the vertical incision the more force per inch of incision is required to bring the edges together. "The force required increased in proportion to the square of the length of the incision. If the incision is lengthened to five inches it will require about 45 pounds pull on each side to hold the edges of the incision together." He further noted that in a series of 20 cases in which an L-shaped incision was employed one side of which was vertical and the other transverse, the lateral tension was in every case thirty times as great as the vertical.

mended (Sprengel,[2] Bakes,[3] Moschcowitz[4]) it seemed in a certain number of cases to be advisable to join entrance and exit wounds in as direct a fashion as possible. The employment of such openings in these cases, I felt, made it more simple to identify all wounded tissues with less handling of the abdominal viscera. I was surprised, at first, to find in those cases in which such incisions were transverse—across the abdomen—that the patients were, in the first place, more comfortable following operation than were those in whom the traditional vertical incision had been employed but, also, that in the presence of suppuration, as was usual under these conditions, healing seemed to progress more favourably.

During the seven year period commencing in the autumn of 1918 the author was in charge of the Surgical Service at Ste. Anne's Military Hospital. During this time all soldiers in Canadian Military District No. 4 who believed that they were suffering from disabilities which might be ameliorated by surgical interference came under his care. During this time several hundred patients were admitted suffering from either post-operative abdominal hernias or pain which appeared to be due in some way to the presence of an abdominal scar. Since the original operations in these cases had been carried out by many different surgeons, some of them the most outstanding figures in the profession (Canadian, British, American), and since the disabilities suffered seemed so important and the difficulties presented in repair were in many cases insurmountable, I was impressed with the disadvantages of vertical abdominal incisions.

AUTHOR'S APPENDECTOMY INCISION

I have already described on several occasions[5, 6, 7] the incision employed in my clinic for removal of the appendix vermiformis. The essential features of this incision are that after the external oblique muscle and aponeurosis are conserved by separate division and retraction, the anterior sheath of the rectus—that is to say the aponeurosis of the internal oblique—is split transversely in the direction of its strong fibres. The rectus muscle is then displaced along with the 11th intercostal nerve and its accompanying vessels, toward the mid-line and the posterior sheath of the rectus, namely the aponeurosis of the transversalis muscle, is split transversely in a similar fashion and the peritoneum opened at the same time. Since this incision commences 1.5 to 2.5 cm. below the umbilicus, its outer border if continued laterally will pass above the iliac crest so that by a separation of the fibres of the internal oblique muscle and the transversalis a sufficiently long incision can be obtained, which permits the hand to be introduced into the abdomen and which, *inter alia*, permits direct exposure of the retrocæcal tissues. Actually this incision may be enlarged laterally without the risk of damage to essential structures as far as the quadratus lumborum muscle.

In the contributions referred to, the fact that in the event of diseased organs within the pelvis requiring surgical intervention the incision may be carried across the mid-line and the right and if need be the left rectus muscles incised transversely is made clear. In this way adequate exposure for any unexpected lesion in the pelvic organs to be dealt with is obtained.

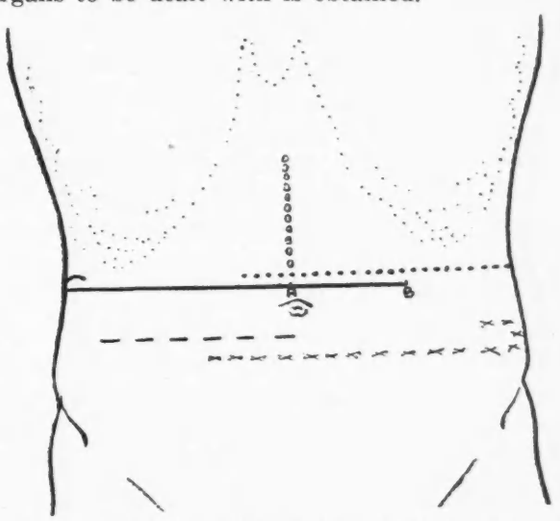

Fig. 1.—Diagram illustrating the abdominal wall to show site of recommended incisions.

——— Skin incision for cholecystectomy and exploration of bile passages. Resection of hepatic flexure A. For gastrotomy or gastroenterostomy B.

– – – – Skin incision for appendectomy and exploration of pelvis and terminal ileum.

. . . . Skin incision for splenectomy. Resection of splenic flexure.

xxxx Skin incision for resection of descending colon, abdomino-perineal resection. (Similar incision on opposite side for operations within pelvis may be used.)

TECHNIQUE OF AUTHOR'S LAPAROTOMY INCISION

The accompanying diagram (Fig. 1) illustrates the site at which incisions for operations upon the various structures within the abdomen are ordinarily placed. In order to make the diagram possible, the incision represented by xxxx has been placed somewhat lower on the abdomen than such incision is, in fact, made. I believe it is of the utmost importance in fashioning the incisions that, whether above or below the umbilicus, the incision should reach

to, or cross, the mid-line within from 1.5 to 2.5 cm. of this structure. If this be done above the umbilicus, the 9th intercostal nerve can be easily found lying on the anterior surface of the posterior sheath of the rectus running obliquely downward and inward; below the umbilicus, the 11th nerve is similarly encountered. Although it is probably not of any great importance whether one nerve be damaged, or not, it is usually possible to protect the nerve, 9th or 11th as the case may be, during the course of operation.

In addition to the incisions as indicated for exposure of (1) right upper quadrant and epigastrium — the gall-bladder, biliary passages, hepatic flexure, and for operations upon the stomach; (2) right lower quadrant—for operations upon the appendix, pelvic organs and terminal ileum; (3) left upper quadrant—for splenectomy or resection of the splenic flexure; and (4) left lower quadrant—for resection of the descending colon or abdomino-perineal resection of the rectum, the line of incision indicated by 0000, which is in the mid-line and which runs at right angles from the transverse incision above the umbilicus, is added willingly in all cases in which unusual difficulties are encountered in the operation indicated above and frequently in the case of subtotal resections of the stomach for carcinoma. This mid-line incision may be carried out either subcutaneously through the linea alba or all the tissues of the abdominal wall in the mid-line may be sectioned. It is needless to point out that a similar incision may, if required, be made downward toward the bladder.

RIGHT UPPER QUADRANT

If the typical incision for cholecystectomy and exploration of the hepatic ducts be described it would seem that the application of the principles indicated, to the other incisions should be clear without unnecessary repetition.

It is my custom in operating upon the gall-bladder to carry the skin incision from slightly to the left of the mid-line to approximately the tip of the 12th rib, on the right side. As indicated above, this incision is usually 1.5 to 2 cm. above the upper border of the umbilicus. At this point the middle semilunar line is above the line of incision. The incision is carried through the skin and subcutaneous fascia down to the anterior sheath of the rectus and the external oblique muscle and aponeurosis.

Following the application of towels to the wound edges, the skin and subcutaneous tissue are retracted gently, and the external oblique aponeurosis and muscle is divided in the direction of its fibres up to the attachment of the muscle to the rib border. As a rule, 1 or 2 cm. of the lower border of the muscle is cut away from the rib border. Since at this point the nerves are deeply placed no damage to them is likely to occur.

Commencing, then, at the mid-line the anterior sheath of the rectus is divided in the line of its fibres, namely, transversely at the same level as the original skin incision. By means of careful dissection the edges of the cut aponeurosis are separated for a distance of 0.5 to 1 cm. from the muscle. The thinnish fascia overlying the internal oblique is divided transversely into the loin. By means of curved blunt-pointed scissors the rectus muscle is displaced at its lateral border from its posterior sheath. Although the rectus muscle is intimately, though not very strongly, attached to its anterior sheath, except at the semilunar lines where the attachment is firm, the muscle is not attached to its posterior sheath. It is consequently easy to insert two fingers behind the loosened muscle and so separate the belly of the muscle widely from its posterior sheath. The 9th intercostal nerve is then brought into view with its accompanying vessels. These structures together with the rectus muscle are then displaced, employing a medium-sized Kocher retractor for the purpose, toward the mid-line. The posterior sheath of the rectus is then incised in the direction of its fibres together with the peritoneum from close to the mid-line outward to its lateral edge. From this point the internal oblique and the transversalis muscles with the subjacent peritoneum are split with the fingers into the loin.

A medium-sized retractor is placed in the wound and moderate traction toward the mid-line and upward is accomplished. Gentle traction with a small retractor downward towards the patient's feet opens the wound sufficiently for exploration, both visually and manually, of the distal two-thirds of the stomach, liver, duodenum, gall-bladder, bile ducts and transverse colon including the hepatic flexure. If spinal anæsthesia is employed little or no force need be employed upon the retractors, nor do the abdominal viscera tend to protrude; consequently, at first at least, there is no necessity for

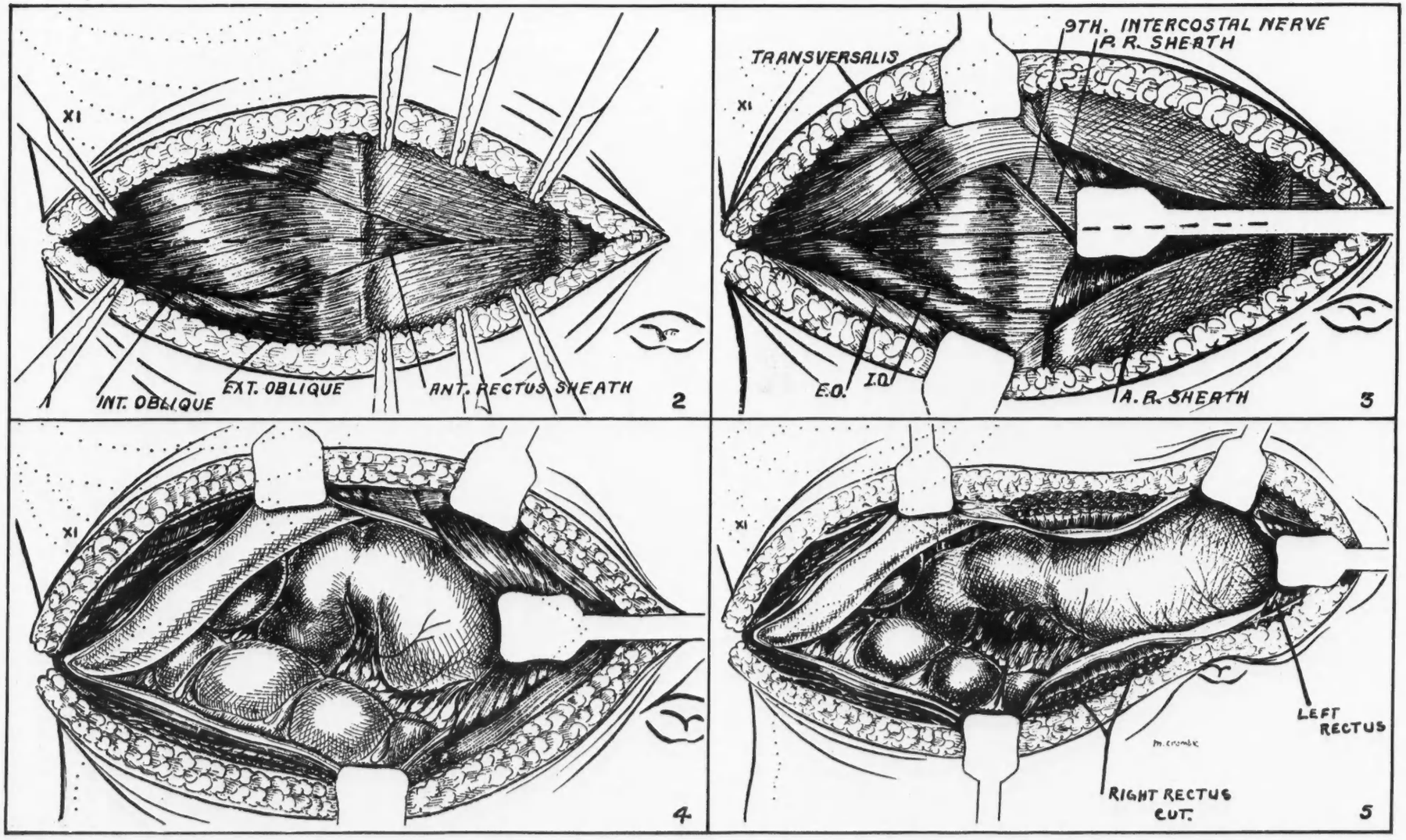

Fig. 2.—Transverse incision above the umbilicus. External oblique split and retracted incision of anterior sheath of rectus and internal oblique indicated by dotted line. **Fig. 3.**—Anterior sheath and internal oblique muscle divided. The rectus muscle and 9th intercostal nerve retracted toward mid-line. Line of incision through posterior sheath and transversalis indicated. **Fig. 4.**—Abdomen opened through transverse incision without division of rectus. Note extension of incision into loin. **Fig. 5.**—Abdomen opened following division of right rectus muscle. Left rectus displaced towards the left.

the introduction of any considerable amount of gauze packing.

Through an incision fashioned in this way, and which it will be noted has followed almost entirely the natural cleavage lines and which has not up to this point damaged any nerve, it is possible, in addition to carrying out adequate and easy examination of the organs mentioned above, to pass the hand into the pelvis, to examine the whole of the large bowel by palpation and, by the employment of traction in the lower lateral corner of the wound, to uncover the cæcum and make possible the removal of the appendix. Should the circumstances of the case demand examination of the small bowel, this is readily accomplished by turning up the transverse colon and omentum.

In the majority of cases in which cholecystectomy is required the abdominal wall is sufficiently lax to make it easy to obtain, through such an incision, adequate exposure of the gall-bladder and cystic, hepatic and common ducts, and to perform the operation quickly and easily. In all cases, however, in which either as the result of pre-operative indications or information obtained at operation it is deemed advisable, or necessary, to open and so explore the common or hepatic ducts I have made it a practice to enlarge the incision to the left so that absolutely no encroachment of the wound edges may interfere with easy dissection under careful exposure. When, therefore, as in operations for exploration of the biliary ducts or gastric resection, more adequate exposure than is obtained by the muscle-splitting incision just described is deemed necessary, the procedure about to be described is added.

With two fingers of the operator's left hand behind the rectus muscle, the abdominal viscera being protected in the meantime by a spread out gauze sponge placed over them, and a heavy pair of scissors employed, the right rectus muscle is snipped across its whole width, pressure from behind being exerted by means of the fingers of the left hand. If the incision is carried out in this way the vessels which are divided can usually be seen prior to sectioning and, in any event, can be clamped without appreciable blood loss or soiling.

The incision thus reaches the mid-line which is crossed by division of the linea alba and the falciform ligament in which one or two bleeding vessels from each end must be ligated. The anterior and posterior sheaths of the left rectus are then divided transversely from one-third to their whole width. In the great majority of instances retraction then of the left rectus laterally is possible without any considerable force being employed, to obtain an opening which permits any type of operation on the biliary tract or stomach to be performed. It should again be pointed out, however, that there is no objection whatever to extending the incision completely across the left abdomen into the loin (12th rib). Furthermore, in the individual case in which, as for instance in the resection of the stomach for carcinoma, clear exposure of the cardiac orifice must be obtained, and in the occasional case in which the costal angle is narrow I have no hesitation in extending the incision vertically upward in the mid-line, or through the left rectus muscle as far as may be required. This occasional extension of the incision is indicated on the diagram by little 0000's. As indicated elsewhere this extension may be subcutaneous if no great length of incision seems indicated or all layers of the abdominal wall may be cut. If the patient's body is then slightly hyperextended in the lower thoracic region either by means of a bar or by "breaking" the table, the wound opens up in a manner comparable to opening a book so that little or no retraction of the wound edges is required.

LEFT UPPER QUADRANT

For purposes of splenectomy or resection of the splenic flexure an incision similar to that which has been described for the right side is carried out. I feel convinced that any surgeon who has attempted either of these sometimes difficult operations by means of the two methods of approach, *i.e.*, vertical or transverse, will be unwilling to again use the vertical incision.

LEFT LOWER QUADRANT

For the abdominal part of the operation of abdomino-perineal resection of the rectum, an incision similar to that already described on the left side of the abdomen below the umbilicus, with division of the left rectus muscle and, if deemed necessary, the right, renders I believe, this somewhat time-consuming and often difficult operation as easy of accomplishment as is possible. It must, however, be pointed out again in this connection that the incision must be close to the umbilicus so that it may be extended laterally (on the left side) into the loin approximately to the quadratus lumborum muscle. For

resection, also, of the descending colon and sigmoid loop whether by the Paul-Mikulitz procedure or by anastamosis, this operation gives as adequate exposure as may be obtained.

When the recommended incision is employed for abdomino-perineal (Miles) resection of the rectum a permanent colostomy is established through a separate elliptical opening above and approximately 5 to 7 cm. to the left of the umbilicus.

If a transverse incision has been employed the simple expedient of "jack-knifing" the patient so that the shoulders and thighs are raised about 15 degrees makes it possible to close the abdomen without any tension whatever, since the upper and lower leaves of the incision can easily be made to overlap one another.

Since the transverse incision may be closed without tension and since it is subjected to but little post-operative strain there is no necessity for the employment of heavy grades of catgut. I have made it a practice to employ continuous double No. 0 chromic gut for the posterior sheath and peritoneum and single continuous No. 0 chromic for the anterior sheath and for the external oblique. No. 00 or 000 plain catgut is used for the subcutaneous tissues.

DISCUSSION

Chief among the objections on the part of both patient and surgeon to exploration of, and the performance of operations upon, the abdominal viscera are risk to life (*a*) from hæmorrhage; (*b*) from infection; (*c*) from shock; (*d*) from post-operative pneumonia; (*e*) from pulmonary embolism.

In so far as *a*, *b* and *c* are concerned, risks to life as a result of abdominal operations, due to hæmorrhage, soiling and shock, are, in the main, determined by the ease with which the organs subject to operative interference are made accessible in order that the surgery required may be rendered as simple as possible. If the transverse incision be properly fashioned it, in our opinion, makes it as easy to expose and so operate upon the individual structures within the abdomen as when any vertical incision is employed. Since forceful retraction of the wound edges is not required, less trauma is inflicted upon the structures of the abdominal wall; necrosis and infection of the wound is, therefore, less likely to occur.

(*d*) Observation, I believe, of but a small number of cases suffices to convince one that the patient whose gall-bladder and bile ducts, stomach or spleen have been operated upon by the employment of the transverse incision suffers very considerably less pain, post-operatively, than the victim of a vertical incision.

Specifically with regard to the matter under discussion, it is possible to induce patients who have been sectioned transversely to indulge in deep breathing exercises more willingly than those cut open vertically. On the other hand, they are able to cough with relatively little pain and, in consequence, do, in fact, cough, and so tend to clear the smaller and larger bronchi of mucus and muco-purulent plugs. The relative infrequency of incidence of massive atelectasis and pneumonitis in cases in which the transverse incision is used is the result (Jones and McClure[8]).

(*e*) It is not my intention in this contribution to discuss the problem of thrombo-phlebitis or phlebo-thrombosis and consequent pulmonary embolus in extenso; there is, however, I believe no difference of opinion as to the importance of early assumption of activity, especially in so far as this refers to abdominal wall and lower extremity movements, in the prevention of massive emboli. There is, I believe, also reason for believing that, within limits, the extent to which the number of days of bed rest may be cut is of importance in this direction. Observation of but a few cases suffices to prove that patients are more willing and able to carry out suitable exercises in bed, and are able and willing to get out of bed at an earlier date, when the transverse incision is used than with any of the usual vertical incisions.

If tight dressings have, as many surgeons believe, a bearing upon the incidence of thrombosis and embolism the fact that wound support from tight dressings is not required when the transverse incision is used may well be of importance in this regard.

In addition to immediate or early post-operative risk to life in consequence of laparotomy as outlined in previous paragraphs, further objections to operation—more especially upon the patient's part, are those due to: (1) post-operative pain; (2) length of time and consequent expense of hospitalization.

Even a limited experience with the post-operative course of patients subjected to transverse laparotomy will convince the surgeon who has not previously used this method of approach that patients are much less uncomfortable. The

fact that post-operative pain due to normal respiration, and more especially to coughing or vomiting, is due to an attempt on the part of the rib borders to tear the abdominal wound apart in the case of a vertical incision, acts in precisely the opposite manner when a transverse incision is used.

Finally, both the patient and surgeon, but more especially the former, consider certain late untoward effects of injury to the abdominal wall to be contraindications to laparotomy. These are: (1) post-operative hernia; (2) pain in the scar; (3) fixation of abdominal viscera.

As indicated in my introduction, it is not my intention to make this contribution a statistical analysis. In order, however, that my experiences may be placed upon record I wish to simply state that post-operative hernia following laparotomy by means of the transverse incision is of much less frequent occurrence than when any vertical incision is used.

The second and third items indicated in this section, namely pain in the scar and pain due to fixation of abdominal viscera, are of so great importance, I believe, that no more than simply passing reference can be made to them in this contribution. Sloan[1] and Bartlett and Bartlett[9] have drawn attention to a fact which the author believes to be of the utmost importance, namely as Sloan says, "that the high incidence of post-operative adhesions on the inner side of the scar is of more consequence than the danger of hernia". Although it is unusual to see a vertical incision, or oblique, two or more years following operation in which the scar is not from 0.8 to 2.0 cm. in width, it is rare that the scar following the transverse incision shows any evidence whatever of having stretched during the passage of years. The likelihood, therefore, of painful scars due to stretching of the tissues following vertical incision would seem to be great, and this apart from any consideration of terminal neuromata, as discussed by Bancroft.[10]

CONCLUSION

To sum up the author is of the opinion that many surgeons fail to realize the benefits, in so far as immediate post-operative comfort and relative freedom from post-operative pulmonary complications and wound disruption, as well as ultimate protection from weak and painful wounds, that the physiologic transverse incision confers in consequence of lack of appreciation, on their part, of certain fundamental features governing the placement and fashioning of the incision. At the risk of restatement I wish, therefore, to tabulate what I believe to be the important features in this regard.

1. It should be determined before operation whether operative procedures within the abdomen are to be carried out chiefly above or below the umbilicus and chiefly to right or left of the mid-line in order that the incision should be properly placed.

2. Whether the incision is to be above or below the umbilicus, it should never be made farther away from this structure than, at most, 2.5 cm. (1 inch). If the incision be placed farther away from the umbilicus a sufficiently long incision may not be possible in consequence of the fact that either the rib border or the pelvic bone is encountered.

3. Although most cholecystectomies and all appendectomies can be easily performed without division of the rectus muscle, no attempt should be made to save this structure at the expense of inadequate exposure. Sound healing of the rectus muscle can be expected in all cases except, perhaps, occasionally in the presence of cachexia or phagedenic infection.

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A NEW APPROACH TO THE KNEE JOINT*

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AN ideal approach to the knee joint is one which (1) will give good exposure and permit thorough exploration of all parts of the joint; (2) will be adaptable to any operation which the pathological lesion indicates; (3) will result in no disability, and (4) will permit of a short convalescent period.

A study of the standard methods of approach to the knee joint reveals that the presence of the patella is the chief obstacle to this ideal. The conception that the patella is a necessary structure and is indispensable to the proper function of the joint appears to have influenced those who have designed the standard exposures of this joint. Lateral incisions, curved and straight, the patella-splitting incision, and the U-shaped incision with detachment of the patellar tendon and reflexion of the patella upwards, all demonstrate the truth of this statement. While the value of these incisions is not questioned, there appears to be an unnecessary fear of making a more direct approach to the joint when wide exploration is indicated.

It has recently been shown that the patella can be removed without any loss of function of the knee. Mr. R. Brooke[1] has reported 30 cases of removal of the patella for *fracture* with excellent functional results. In concluding his paper Mr. Brooke states, "The patella is an integral part of the skeleton phylogenically inherited, and function plays no part either in its formation or its growth. In man it subserves no important function. It is a morphological remnant which is tending to undergo reduction and disappear. It has become modified to take part in the movements of the knee-joint, but its presence is incidental and is a deterrant rather than an aid to these movements. Experimental and other evidence has been advanced to show that in its absence the efficiency of the knee-joint is, if anything, increased, both as regards rapidity of movement and of power."

Mr. Hey Groves states, "When I first read Mr. Brooke's paper my reaction was one of frank incredulity. I asked if he would show me some of his cases and he promptly acceded to my request. In December he showed me eight of them, two women and six men, and I found that his claim of having restored these people to full functional activity by excision of the patella was fully justified. It was impossible in any case to detect any difference between the functional use of the injured and the uninjured leg."

Professor Whitnall, of the Anatomical Department of Bristol University, made two preparations for Mr. Hey Groves which fully explain the matter. I repeated this work on the fresh cadaver and I am able to confirm his observations. "A longitudinal section of the knee-joint shows that the quadriceps tendon merely passes over the patella to become continuous with the patellar tendon below. The tendon is intimately attached to the central anterior portion of the patella and can be separated only with difficulty, but the upper and lower margins of the patella are covered with fat and give no attachment to any ligamentous fibres. The second preparation shows a front view of the knee joint after the patella has been removed. Pulling on the quadriceps tendon still produces extension of the knee. It is evident that quite apart from those fibres of the quadriceps tendon that pass over the patella to the ligament below there are ample fibres of the tendon present at either side of the patella to carry on continuity. Those on the medial side go partly to the patellar ligament and partly to the medial tuberosity of the tibia. Those on the lateral side go partly to the patellar tendon and partly to the iliotibial band inserted into the lateral tuberosity." These considerations led me to the belief that a more direct and adequate exposure of the knee joint could be made through the quadriceps and patellar tendons after the patella has been removed. Consequently I carried out operations on twenty fresh cadavers in order to demonstrate as far as possible that the procedure was anatomically sound, and to assure myself of its advantages.

This work suggested an additional advantage of this approach, namely, that when an excision of the knee joint is contemplated an exploration

* Read at the Seventieth Annual Meeting of the Canadian Medical Association, Section of Surgery, Montreal, June 21, 1939.

of the joint may be made first, and the final decision as to whether a resection is to be carried out need not be made until the lesion is exposed and examined. If a mistake in diagnosis has occurred the joint may be closed without damage. Consequently, the first cases in which I used this approach were cases in which resection was contemplated. These cases demonstrated the excellent exposure which was possible. After this experience I was fortunate in being able to perform the operation on a case of internal derangement in which wide exploration of the joint appeared to be necessary.

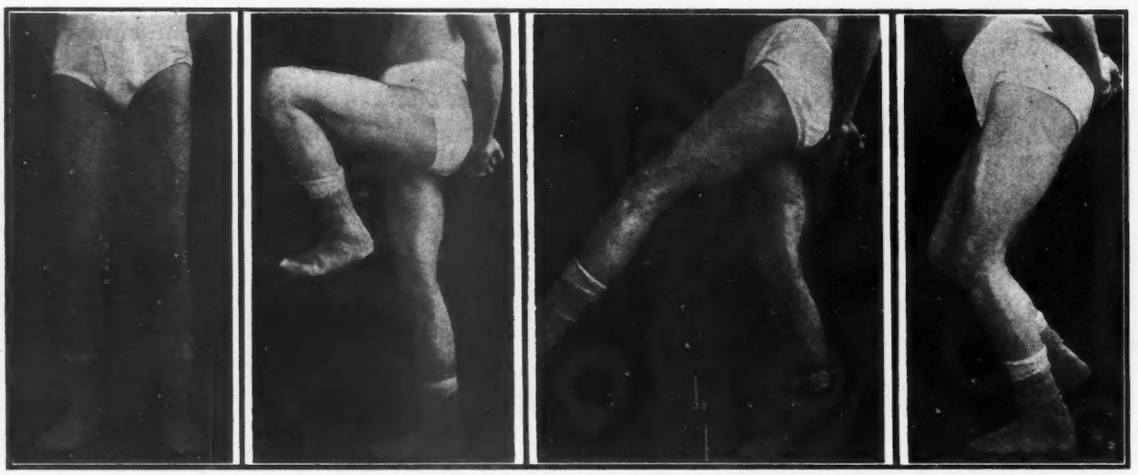

Fig. 1 Fig. 2 Fig. 3 Fig. 4

Fig. 1.—Compare knees. Note inverted horseshoe incision on left knee and complete extension. **Fig. 2.**—Flexion of involved knee. **Fig. 3.**—The patient is standing on his normal leg, with the affected leg extended. **Fig. 4.**—The man is standing and bearing his full weight on the affected leg, which is slightly flexed.

After administration of the anæsthetic (spinal), the patient was placed in the supine position, with the knees flexed over the end of the table. A curved infra-patellar incision was made. The skin flap was then dissected upwards and the patella and quadriceps extensor tendon exposed. The tendon overlying the patella was split longitudinally and the incision carried upwards into the quadriceps tendon and downwards into the patellar tendon. The patella was dissected out through this incision with the help of a sharp periosteal elevator. The joint was thus exposed and the incision may be carried up or down as far as desired. Retraction gave an excellent view of the joint. In this case serious erosion of the external condyle of the femur was demonstrated, associated with a large cyst at the anterior end of the external meniscus. The joint was literally filled with small loose bodies and eight of moderate size. These loose bodies and the external meniscus were removed. The wound in the quadriceps and patellar tendons was closed, the skin flap replaced and sutured.

SUMMARY

An approach to the knee joint is sought which will permit thorough exploration, and one which will also be adaptable to any operation which the pathological lesion indicates. In addition, complete repair without disability must be possible, if the lesion is one which may be removed or repaired.

The approach which is suggested and demonstrated is one which entails the removal of the patella, and one which lends itself to various modifications depending upon the lesion encountered.

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POTASSIUM CHLORATE IN THE TREATMENT OF POLIOMYELITIS*

BY JEAN SAUCIER AND OSCAR W. STEWART

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DURING an epidemic of poliomyelitis in Switzerland in 1936-37, C. Contat[1] observed and treated 35 cases and recorded the curative effect of potassium chlorate given in the preparalytic and early paralytic stages of this disease. During an epidemic, in which the general mortality rate was 20 per cent, this author reported no deaths and only two instances of residual paralyses amongst his 35 cases. This paper was published in 1938 and received little or no general notice.

The clue to the treatment of poliomyelitis with potassium chlorate evolved when he gave the drug for the symptomatic relief of the sore throat which was an accompaniment of the first case, and then concluded that it had favourably influenced the course of the disease. His observations regarding the beneficial effect in subsequent cases seemed critical and objective. However, in a disease notable for its varied clinical picture and embracing many cases wherein the paralytic phenomena are mild or absent, Contat recognized that clinical observations and conclusions might be unreliable and that animal experimentation would help to prove the impression.

With the aid of Arthus, Spycher and Debat,[2] experiments were carried out on monkeys. Their last experiment consisted in the intracerebral inoculation of 9 monkeys (*Macacus rhesus*) with the virus of poliomyelitis. Three of the group were untreated and served as controls. The six remaining ones were divided into two groups of three each. One group of three was begun on treatment immediately after inoculation and the other three were started on treatment forty-eight hours after the inoculation.

Treatment consisted of the oral administration of potassium chlorate in raspberry syrup as a vehicle. The dosage was 10 centigrams per kilogram of body weight of the animal per twenty-four hours. This amount was given in twelve divided doses, *i.e.*, every two hours, day and night. It was this dosage that Contat had empirically used in the human cases in 1936-37.

The three untreated animals all developed the disease from 7 to 9 days after the inoculation. Two of these died and the third lived, although paraplegic. Of the six treated animals, only one developed the disease and the authors stated that this animal refused to take the potassium chlorate solution after 4½ days of treatment. No mention is made of the animal's condition at the time he first refused the medication.

The results of this animal experimentation seemed to give striking confirmation to the clinical impression of Contat.

Was there in the offing another chemotherapeutic triumph equal in its effectiveness and implication to sulfanilamide? To us, this question naturally arose, and with it a host of speculations as to the mode of action of this simple, long-known compound, potassium chlorate. The rôle of potassium in cell metabolism! The effectiveness of potassium chlorate in familial periodic paralysis! These and other musings emerged from the shimmering background of this discovery-spectacle, only to be met by the doubts and misgivings engendered by the long-time search for a preventative or cure for poliomyelitis. The saga of this search has been notable for the periodic hopeful claims which have arisen each in their turn, only to be discredited, and, in a regrettable few, after irreparable harm had resulted from them. In addition, there was the knowledge of the pitfalls which trap the unwary worker. For the monkey, in his mocking mimicry of man, reacts to this disease at times in a likewise capricious manner.

With these misgivings, countered by a frank enthusiasm for the possibilities embodied in the experimental results reported by these authors, we felt that a detailed repetition of their experiments was warranted. If results approaching or equalling their own were forthcoming, further and more extensive work in this same category would then be imperative. If, on the other hand, our work failed to corroborate their findings, a timely check to any premature hosannas would be worthy of the effort. It was in this spirit therefore that the work was undertaken and is now reported.

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THE FIRST GROUP OF EXPERIMENTS

Four seemingly healthy monkeys (*Macacus rhesus*) were used. Their weights were recorded and they were isolated in separate cages. All four were inoculated according to the technique described below. Two served as controls and two were begun on treatment immediately after the inoculation. All were observed every two hours and diary notations made daily concerning their behaviour. Temperature readings were made thrice daily, beginning on the fourth day.

Preparation of the virus.—The virus was obtained from Dr. W. L. Aycock, of the Harvard Medical School, and consisted of three small sections of spinal cord from three monkeys previously prostrated with the disease. The sections of cord were preserved and transported in glycerine. Bits of each cord were included to make up a total amount weighing 0.5 g. The excess glycerine was washed off, using sterile saline solution. This amount of cord was then placed in a mortar with a little sand and ground into a mush, the mortar, pestle and sand having been previously baked in an oven for fifteen minutes at a temperature of 400° C. and then allowed to cool. (Aseptic precautions were used throughout the preparation). To the ground-up cord and sand 10 c.c. of sterile normal saline were added and mixed thoroughly. This fluid was then centrifuged at low speed for 1½ minutes and the supernatant fluid removed by syringe and needle. The suspension was used for the inoculations.

Inoculation.—The upper eyelid and skin over the superior orbital ridge of the animal was iodinized, and to a syringe, containing 0.5 c.c. of the virus fluid, an 18 gauge venipuncture needle was attached. This needle was then quickly thrust through the skin of the upper lid and inserted so as to rest on the roof of the bony orbit about 0.5 cm. posterior to the superior orbital ridge. The line of the needle was then directed parallel to the nasal bones and thrust through the orbital plate into the substance of the frontal lobe for a distance of 0.5 to 2 cm. After withdrawing the plunger, to make sure that the needle point was not in a vessel, the 0.5 c.c. of virus-containing fluid was injected. This method proved to be relatively simple and obviated the necessity for trephining.

Treatment.—On the basis of the animals' weight in kilograms a formula was calculated for each animal to be treated, and the solutions were made up. The dosage for each was 10

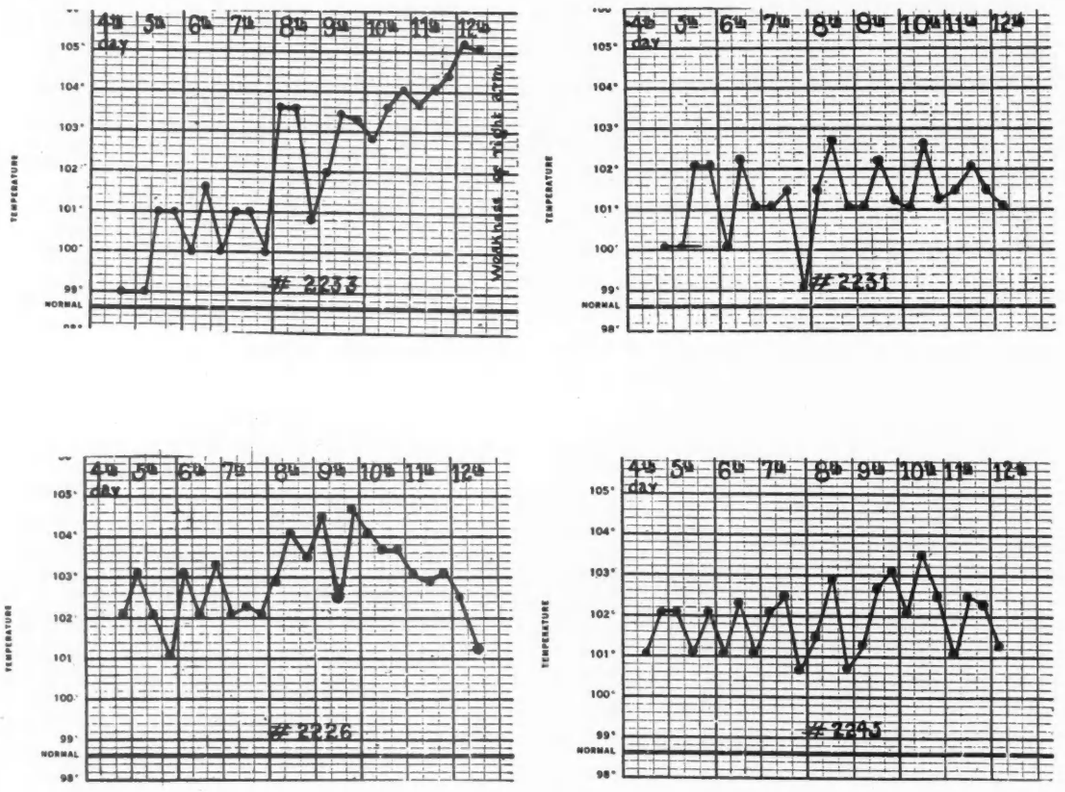

Fig. 1.—Rectal temperature charts of four animals in first group of experiments. Nos. 2233 and 2231 are the treated animals and Nos. 2226 and 2245 the controls.

centigrams of potassium chlorate per kilogram of body weight per 24 hours. This amount, in a suitable amount of water and plain elixir (for taste), was given in twelve divided doses, *i.e.*, every two hours, day and night. Both animals took this prescription without objecting. It was easily administered by means of a 20 c.c. syringe, the glass tip being placed between the teeth.

During the period of incubation the monkeys were fed their usual diet. The potassium chlorate solution seemed in no way to influence their eating or fluid intake, with the exception of No. 2233, who, concomitantly with the appearance of the prodromal symptoms, refused both food and medication. The latter, thereafter, was given by means of a small catheter inserted into the stomach by way of the nasal passages.

THE RESULTS OF THE FIRST GROUP OF EXPERIMENTS

On the 8th day following the inoculation, one of the treated animals (2233) developed a sharp rise in temperature. With this, he refused the medication by mouth and ate very little food. The medication, however, was given by nasal catheter. For the next two days his temperature remained elevated and he became excitable. On the 12th day, weakness of the right arm was noted. Despite continued treatment the paralysis spread, to involve both arms and both legs, prostrating the animal, and he was killed on the 14th day. Typical lesions of poliomyelitis were demonstrated in the cord preparations.

The three remaining animals—two controls and one treated—showed no definite evidence of the disease except No. 2226 (control). This animal manifested restlessness for two or three days coincident with a temperature rise (see Fig. 1). It is interesting to note that all of the animals showed a distinct temperature elevation on the 8th day. This fact is adduced, together with the charts, as suggestive evidence that these experimental animals do develop subclinical poliomyelitis. Autopsies were not done on the surviving animals, nor was the spinal fluid examined, therefore this evidence cannot be given as additional support.

Fortunately for us this first group of experiments terminated in this manner. Obviously, either the potency of the virus used or the individual resistance of the animals, or both, served to offset symmetrical results. Had the two treated animals been spared in a biological coincidence, we would have been sorely tempted to join in the acclaim of merit for this therapeutic agent. As it happened, however, the only animal that became paralyzed was a treated one, and the paralysis spread, with increasing general symptoms, despite the fact that treatment was continued until the animal was killed.

Admittedly, this first group of experiments cast considerable doubt on the efficacy of potassium chlorate in protecting the monkey from experimental poliomyelitis.

There remained, then, the task of securing uniform production of the disease to render the results more concise. A second and third group of experiments were then carried out.

THE SECOND GROUP OF EXPERIMENTS

Another group of four monkeys was inoculated as before, using a different strain of virus. The experiment was carried out in identical fashion, except that the dose of potassium chlorate was doubled (20 centigrams per kilogram per 24 hours), and raspberry syrup was used as the vehicle (to conform to the original experiments).

THE RESULTS OF THE SECOND GROUP OF EXPERIMENTS

On the 15th day two animals showed temperature elevations—one control and one treated. In one (No. 2243), a control, the elevation persisted. Some clumsiness was evidenced, suggesting weakness of the back muscles, but no definite paralysis of the extremities was noted. The temperature gradually subsided and, aside from this, there were no positive results.

THE THIRD GROUP OF EXPERIMENTS

Another strain of virus, known to be potent, was obtained for us by Dr. W. L. Aycock from Dr. James D. Trask, of the Yale School of Medicine. Four animals were inoculated as before, and treatment begun on two. In this group too, the dosage was doubled, *i.e.*, 20 centigrams per kilogram per twenty-four hours. The protocols follow.

Monkey No. 2244 (treated). — October 19th. — Inoculated intracerebrally with 0.5 c.c. October 26th.—More irritable. Rectal temperature 103°. October 27th.—Refused all food. More excitable. Rectal temperature, 104.8°. October 28th.—Coarse tremor. Weakness, right arm, back, and both legs. October 29th.—Constant severe tremors. Weakness of back and four extremities. Rapidly progressing prostration; lying helpless on floor of cage. Rectal temperature 102.6°. Killed 10 p.m.

Monkey No. 2239 (treated). — October 19th. — Inoculated intracerebrally with 0.5 c.c. October 26th.—Refused to take medication by mouth. Medication given by tube. More excitable. Rectal temperature 102.4°. October 27th.—Refused all food. More excitable. Rectal temperature 104°. October 28th.—Weakness, right arm. Refused all food. Medication continued by tube. Rectal temperature 102.4°. October 29th.—Weakness of right arm more pronounced. Some generalized weakness of legs. Rectal temperature 104°. Slight generalized tremors and ruffling of fur. October 30th.—Weakness of right arm. Slight weakness of left arm. Weakness of back muscles and legs. Generalized coarse tremors. Rectal temperature 103°. October 31st.—Increased weakness. Rectal temperature 102°. November 1st.—Marked weakness of arms, legs and back, but able to sit and move about in cage. November 8th.—Complete paralysis of left leg. Almost complete paralysis of right leg. Marked weakness of back and arms. Killed.

Monkey No. 2237 (control). — October 19th. — Inoculated intracerebrally with 0.5 c.c. October 26th.—Appetite poor. Rectal temperature 101°. October 27th.—Excitable. Rectal temperature 102°. October 28th.—Slight tremors. Rectal temperature 104.4°. October 29th.—Slight weakness right arm. Rectal temperature 104°. October 30th.—Weakness, right arm more pronounced. Rectal temperature 104°. October 31st.—Right arm completely paralyzed. Weakness in left arm and legs. Rectal temperature 102°. November 1st.—Prostrate on floor of cage. Killed 10 p.m.

Monkey No. 2235 (control). — October 19th. — Inoculated intracerebrally with 0.5 c.c. October 26th.—Appetite poor. Rectal temperature 101°. October 27th.—More excitable. Rectal temperature 101.2°. October 28th.—Slight generalized tremors. Rectal temperature 104°. October 29th.—Slight weakness of right leg. Rectal temperature 104°. October 30th.—Increasing weakness both legs. Rectal temperature 103.2°. October 31st.—Both legs almost completely paralyzed. Both arms weak. Rectal temperature 102°. November 1st.—No change. Rectal temperature 102.2°. November 8th.—Complete paralysis of both legs. Marked weakness of both arms. Killed.

THE RESULTS OF THE THIRD GROUP OF EXPERIMENTS

In this group all four of the animals developed the disease. The course of the treated animals was similar to that of the controls, excepting that the former developed signs of the disease earlier. This was thought to be due to the handling. The microscopical lesions of the cord preparations showed extensive and identical lesions.

SUMMARY

Three groups of experiments are reported which were designed to repeat as exactly as possible the work reported by Contat, Arthus, Spycher and Debat, in which they claimed to have obtained evidence of specific protective action in potassium chlorate against experimental poliomyelitis in monkeys.

In our experiments we feel we have attained this duplication, with the exception of probable difference in the virus strains and the acknowledged but unavoidable variation in individual resistance to the disease in each experimental animal. These two exceptions, noted for the sake of reportorial accuracy, do not, in our opinion, alter our basic clear-cut results, which contradict the work of Contat, Arthus, Spycher and Debat, and we can only conclude that potassium chlorate is of no value against the development or course of experimental poliomyelitis in monkeys.

CONCLUSIONS

Potassium chlorate, given orally in doses of 10 and 20 centigrams per kilogram of body weight per 24 hours, failed to protect or favourably influence the course of the disease in monkeys (*Macacus rhesus*) inoculated with the several strains of poliomyelitis virus used in our experiments.

We are indebted to Dr. W. V. Cone for his helpful suggestions during this investigation.

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TOTALITARIANISM EXAMINED.—Totalitarian theories of war and education were put on the dissecting table by Prof. Walter Thomas Woody of the University of Pennsylvania and Prof. Hans Kohn of Smith College. The totalitarian powers actually invert the war philosophy of Clausewitz, favourite philosopher of militarists, Prof. Kohn pointed out. Clausewitz held that war was a continuation of politics by other means, and the hard-boiled old realist Bismarck agreed with him and acted on the principle. Totalitarians, however, go far beyond that "blood-and-iron" doctrine. They regard war, not peace, as the normal state of nations; with them politics is a continuation of war, "while what is called peace is only a pause between the real events, preparing for them, subservient to them." Prof. Woody, taking up the question of education in totalitarian states, sees them pursuing a policy equally hostile to "the universalism which sought to unify Europe in the Middle Ages and the liberal educational principles that stemmed from early rationalism and from naturalism of the eighteenth and nineteenth centuries." This would appear to explain the simultaneous attacks, conducted in all totalitarian countries, against organized religion on the one hand, and on the other against freedom of speech, freedom of the press, and academic freedom in the universities.—*Science News Letter*, November 25, 1939.

A FATAL CASE OF ACCIDENTAL POISONING BY CHLORATE OF POTASSIUM: WITH A REVIEW OF THE LITERATURE

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ALTHOUGH Cushny[1] and Ansbacher[2] state that cases of potassium chlorate poisoning are now very rare a number of cases have been recorded since Jacobi in 1879 first pointed out that the drug was poisonous and may prove fatal. Up to 1911 Witthaus[3] collected 155 cases, of which 116 were fatal, most being accidental, 15 suicidal, and 3 homicidal. Since then Rosenbloom,[4] Bécart,[5] Bernstein,[6] Ansbacher,[2] Gettler and St. George,[7] and Greengard[8] have all published cases. Of these 5 were accidental with 2 recoveries, and 1 a fatal suicidal case. The following case presents many points of interest.

Case Report

History.—The patient, a white male, aged 43 years, worked in the papermill until July 1, 1937, when he developed Bright's disease and was unable to work subsequently. He had hypertension, albuminuria and œdema. On October 4, 1938, on account of the amount of dropsy, it was decided to omit the sodium chloride from his diet and substitute potassium chloride as the latter is excreted with great rapidity. Ten grams (2½ drachms) of potassium chloride was prescribed, to be used in his food daily, and any that was not consumed was to be dissolved in water and drunk at the end of the day. On October 6, 1938, about noon, the patient was seen and complained of some pain in his neck and legs but his general condition was unchanged. On October 8th an urgent call was received stating that the patient was very ill, almost *in extremis*. He had started to vomit during the evening of the 7th and had some diarrhœa. When examined about 10 a.m. on October 8th he complained of extreme weakness and pain across the upper abdomen. He had a dusky cyanotic appearance with air-hunger on admission to hospital. His respirations were rapid; pulse was rapid and thready; conjunctivæ icteric. The urine was scanty, had a dark brown smoky character, and contained blood. His blood serum was also dark brown in colour. There was marked tenderness on palpation in both lumbar regions. Why he should have suddenly become so seriously ill and have the above symptoms, pointing to blood destruction, constituted a puzzle, and it was decided to check at the drug store, where it was found that the clerk had substituted potassium chlorate for the potassium chloride which had been ordered. This fitted the whole clinical picture.

The patient remained in a very grave condition, with marked air-hunger and increasing loss of consciousness, gradually passing away in spite of the recognized treatment for potassium chlorate poisoning, namely, sodium bicarbonate solution given intravenously and other supportive measures. He died at 11 a.m. on October 13th.

The potassium chlorate was taken regularly from the evening of October 4th until the morning of October 7th, approximately 30 to 35 grams (8 to 9 drachms) being taken over a period of 3 days.

Autopsy findings.—The body was that of a white male, height 5 ft. 8 in., weight approximately 145 lbs., with a waxy yellowish skin. Post-mortem lividity was showing about the buttocks and back of the shoulders and had a somewhat darker and more chocolate brown colour than usual. Rigor mortis was absent. The muscles had a dusky colour, which was revealed on incising the rectus abdominis.

The pleural sacs each contained about 4 ozs. of a straw-coloured fluid. The lungs partially filled each side of the chest, had a spongy consistence, and were of a greyish pink colour, with a few fine adhesions at both apices. Towards the bases posteriorly they showed œdema and congestion, and in the alveoli were some "heart-failure" cells, containing broken-down blood pigment.

The pericardial sac contained 4 ozs. of straw-coloured fluid. The heart was enlarged, weighing 13 2/3 ozs., instead of the normal 10 ozs. The left auricle and ventricle were somewhat hypertrophied and dilated, the mitral valve being somewhat incompetent. There was a slight dilatation and hypertrophy of the right side, the tricuspid valve being also slightly incompetent. The pulmonary and aortic valves were healthy, and through them extended agonal stringy ante-mortem thrombi. The epicardial fat was slightly jaundiced and the myocardium rather pale and clouded-looking from toxic change. The coronary arteries were somewhat thickened and arteriosclerotic but not thrombosed. The aorta was healthy, but its wall showed a brownish-red discoloration.

Blood.—A sample of blood taken from the right auricle had a rather dark brownish-red colour and on spectroscopic examination showed the presence of oxyhæmoglobin and a trace of methæmoglobin.

The peritoneal sac contained 150 c.c. of straw-coloured ascitic fluid. The stomach on gross and microscopical examination revealed an acute gastritis. The stomach contents measured 150 c.c., and had a yellowish-brown mucinous character, containing no solid matter. On extraction by dialysis the extract proved to have a trace of chlorate present, which was too small to estimate quantitatively.

The intestines were collapsed and very pale, and showed a mild enteritis.

The liver weighed 1,860 g. and was somewhat bile-stained, fatty and congested. Histological examination confirmed the fatty degenerative change and the congestion. In the capillaries many reticulo-endothelial or Kupffer cells were seen, containing broken-down blood débris. The gall bladder contained a little dark blackish bile, but its wall showed no special change.

The spleen weighed 115 g., was slightly enlarged, dark red and soft. Numerous hæmorrhages into the splenic pulp, congestion of the vessels, and many large reticulo-endothelial cells with phagocytosed disintegrated red cell remains were found on histological examination.

The adrenals and pancreas showed no special abnormal change.

The kidneys were both considerably enlarged, weighing 187 and 192 g., respectively. Their capsules stripped easily, leaving comparatively smooth surfaces. On section there was a peculiar reddish brown striping of the pyramids, which is stated to be characteristic for potassium chlorate poisoning. On histological examination the renal tubules in these areas were filled with brownish masses of blood detritus and the vessels were very

hyperæmic. In addition, patchy areas of atrophic fibrosis, corresponding to arteriosclerotic thickening of the interlobular arteries, were found. The renal tubules also showed catarrhal change and cloudy swelling. Chemical analysis of the kidney substance, after dialysis, showed the presence of chlorate in the extract in considerable quantity. The ureters and urinary bladder revealed nothing of note.

Urine (obtained from the renal pelves) had a cloudy brown colour, and chemical examination revealed the presence of much albumin and a considerable quantity of chlorate. On microscopical examination some red cells, epithelial casts, and cell débris were detected.

The brain and spinal cord were not examined.

Analyses of the remainder of the powder supplied to the patient and of a sample from the bottle of potassium chlorate in the drug store were made. Both consisted of a white crystalline powder, dissolving slowly in cold water (solubility, 1 in 16), and gave positive tests for potassium and chlorate and a trace of chloride. After drying, the powders proved to be alike, containing over 99 per cent of potassium chlorate.

The method employed in the chemical analysis was as follows. The chopped materials were placed in a thin layer in the inner chamber of the dialyzer. Distilled water was placed in the outer vessel. The dialysis was kept going for about 6 hours without changing the water in the outer vessel. This water was then evaporated to dryness in a porcelain dish and dissolved in the least possible quantity of distilled water. The indigo, silver nitrate, and iodine tests were then made.

So far as can be gauged in the present case the fatal dose was approximately 30 to 35 g. (450 to 525 grains) taken over a period of 3 days.

REMARKS

The fatal dose, as Cushny[1] points out, varies greatly. Two drachms of the salt given in divided doses every 10 minutes to two children over a period of 3 hours caused death in a short time (Brouardel[9]); 15 grains given to a 3 weeks-old infant (Goldschmidt[10]); a girl of 11 years took 200 grains over a period of 2 days and died on the 6th day (McShane[11]); a man, aged 18 years, took about an ounce in water in two doses at an interval of ½ an hour and died on the 6th day (Landerer[12]); Gettler and St. George's[7] case was a 3 year old boy who took a gargle containing 45 to 60 grains and died in 6 hours. On the other hand 46.7 grams (719 grains) have been taken by an adult over a period of 13 hours with recovery (Gesenius[13]), while Hofmann[14] states that 23 grams (345 grains) have been taken by an adult within 12 hours without causing symptoms of poisoning.

Apparently potassium chlorate shows a peculiar action in that a certain amount when given in divided doses over a period of a few days may show a more severe reaction than if the same amount were taken in one dose (Webster[15]). Thus, the smallest single dose that has caused death was 14 g. (210 grains) taken by an adult, who died in 4 days (Reiss[16]), while 11.75 g. (176 grains), taken by an adult over a period of three days, was fatal (Zillner[17]). Taylor[18] states that idiosyncrasy seems to have some influence, and Cushny that poisoning is more liable to occur in nephritics than in normal persons.

The onset of symptoms.—As a general rule these appear in 2 or 3 hours after the drug has been taken, shown by gastro-intestinal irritation. In the present case the symptoms commenced in approximately 48 hours with pain in the legs and neck. Vomiting and diarrhœa did not manifest themselves until the evening of the 3rd day after the initial dose.

Fatal period.—The patient lived for 9 days after the initial dose, or 5 days after the last dose, but Witthaus[3] states that the average duration of 90 fatal cases was 4 days and 9 hours. Smith's[19] textbook gives 2 to 3 days. Death may occur in a few hours but many cases last for 4 days or more.

Symptoms and action.—In rapidly progressing fatal cases there are severe vomiting, profuse diarrhœa, marked epigastric and abdominal pain, intense dyspnœa, deep cyanosis, greatly lowered blood pressure, and cardiac weakness, as shown by a feeble, sometimes irregular, pulse. The patient complains of headache, giddiness, and muscular weakness, is restless, and eventually becomes comatose before death.

In cases of subacute poisoning, to which our case belongs, vomiting and diarrhœa are also observed, the vomited matter often containing large quantities of bile, less often blood. There may be complete anuria for a time, or the urine is scanty, at first dark coloured, then reddish brown; it contains hæmoglobin, methæmoglobin, and hæmatin in solution. On standing it deposits casts of brownish amorphous particles, and chlorates are obtained in considerable quantity. Cushny states that the methæmoglobin may disappear from the urine after one or two days but the casts remain longer. The most marked general action is exerted upon the red blood corpuscles, their hæmoglobin being converted into methæmoglobin with the production of chocolate-coloured blood. The red cells at first appear normal in shape, later shrunken, and the hæmoglobin passes out to a large extent. According to Kobert[20] the conversion to methæmoglobin may be so marked that the oxygen content of the blood sinks to as low as 1 per cent. This leads to such secondary symptoms as jaundice (of hæmolytic type with a raised icterus index and indirect van den Bergh reaction), methæmoglobinuria and signs of marked irritation of the kidneys. The cardiac effects are in part due to the action of the potassium ion,

McGuigan[21] claiming that in acute cases fragmentation of the heart muscles is a frequent cause of death. This was not noted in the present case.

Cushny's explanation of the action of potassium chlorate is that asphyxia results, when the transformation to methæmoglobin takes place in the vessels, from inability of the blood to carry available oxygen, and that this is probably the chief cause of the symptoms of the fatal issue in the most acute form of intoxication, but when sufficient hæmoglobin remains to continue the respiration of the tissues the subacute form of poisoning results from the hæmolysis; the hæmoglobin and fragments of the corpuscles obstruct the renal tubules with masses which may appear as casts in the urine or cause complete suppression. The fatalities in subacute poisoning, he thinks, appear to be the result of these renal changes.

Ulrich and Shternor[22] state that fatalities following the ingestion of excessively large doses of chlorate are due predominantly to the toxicity of the cation constituents, the presence of methæmoglobin being a contributory rather than a causative factor. Richardson[23] agrees with this, claiming that methæmoglobinæmia requires first hæmolysis or injury to the red cells, and that it is not the first nor an important phenomenon in chlorate toxicity except just before death or for identification post-mortem. They question the generally accepted view that the blood changes, and especially the formation of methæmoglobin, are responsible for the symptoms. Their work seems to be supported by the methæmoglobinæmia of sulfanilamide toxicity being relatively unimportant.

Headache, muscular weakness, and abdominal pain are also found and uræmic symptoms with delirium, convulsions, and coma may arise. Death has followed the latter as late as a week after the first toxic symptoms, but in several cases complete recovery has resulted after the gravest symptoms (Bécart,[5] Greengard[8]). The latter describes a case of toxic chlorate encephalopathy in a child of 4 years.

The changes in the organs are usually in proportion to the extent of the methæmoglobinæmia, the kidneys showing the most intense effects, but there may be enlargement with pain and tenderness of the liver and spleen as well. The kidneys show an acute parenchymatous nephritis or nephrosis with pain in the loins, and in the less severe though still fatal cases the kidney changes are more prominent. The increasing cyanosis and gradual respiratory failure are due to the destruction of the red cells and conversion of oxyhæmoglobin into methæmoglobin, which is of no value as a respiratory pigment. Cushny has shown that the conversion can take place in 4 hours. The characteristic changes in the red corpuscles, too, are better noted in such cases. The number is diminished, irregular forms are seen, especially prominent being the shadow cells, the ovoid types, the crenated forms, and there is a tendency for the cells to agglutinate, so that a fatal embolism may arise (Webster). Bécart's case showed a drop in the total red cells to 2½ millions per c.mm. in 24 hours. The number of white cells may be increased and the alkalinity of the blood is lowered. Although potassium chlorate has no direct effect on the central nervous system chronic convulsions and fixation of the muscles of the extremities and coma being often present, but such effects are usually secondary to the asphyxia and renal changes. In the present case the pain in the lower extremities and neck were the earliest symptoms noticed.

Post-mortem appearances.—These are gastroenteritis; dusky grey appearance of the whole body including the musculature and walls of heart and aorta due to methæmoglobinæmia; the blood is greyish brown, chocolate brown, or a darker brown resembling tobacco juice or coffee grounds, according to the intensity of the blood changes, and gives the characteristic spectrum of methæmoglobin, but these changes may not be present if death has occurred some time after the poisoning or if the autopsy is not performed for a few days. The liver, spleen and kidneys are usually enlarged and filled with decomposition products of hæmoglobin. The kidneys show specially characteristic changes, the tubules being filled with brownish masses of blood detritus, giving a peculiar striped appearance to the pyramids and also some nephrosis. The brain appears injected with chocolate.

Most of the above changes were found in the present case, but in a less marked degree as the patient lived for 5 days after the last dose. Potassium chlorate, too, was obtained from the urine, kidneys, and a trace from the gastric contents, in spite of its relatively rapid conversion into chloride in the body.

Treatment.—In acute cases the stomach should be promptly washed out to remove any poison remaining. Intravenous injections of sodium

bicarbonate or methylene blue, or repeated blood transfusions, may be tried. Bécart quotes a recovery in a woman aged 55 years who took 40 g. (600 grains) of potassium chlorate in mistake for sodium sulphate. She made a complete recovery following two transfusions of 200 c.c. of blood. Diuresis should be promoted by the administration of alkaline drinks, and elimination through the saliva may be stimulated by hypodermic administration of pilocarpine. Cardiac and respiratory depression require appropriate stimulants. In some cases inhalation of oxygen may prove of value.

COMMENTS

This case is an object lesson to medical practitioners when prescribing potassium chloride in the treatment of nephritis with œdema that they should make sure that the proper drug is dispensed, even when potassium chloride is written in full as was done in the present instance and in Dr. C. W. Holland's case. Dr. Holland had a similar experience (unpublished), but fortunately his patient was not so conscientious as ours and discontinued taking the drug because of nausea, epigastric pain and vomiting, symptoms which were late in appearing in our case.

The danger of the use of potassium chlorate in solution as a gargle, prescribed over the telephone, but given in mistake by mouth, is exemplified by Gettler and St. George's case,[7] and the danger of leaving tablets of it in an accessible position, where they may be mistaken for sweets by a child, with fatal consequences (Taylor), cannot be stressed too strongly. Bernstein[6] describes the case of an insane army officer who committed suicide by swallowing approximately 7.5 g. (112.5 grains) of potassium chlorate in Pebeco tooth paste. Richardson[23] emphasizes the toxic potentialities of the continued administration of chlorate for the blood and tissues, and warns against chronic poisoning from the use of tooth paste containing it. In Austria there is a law limiting the amount to 10 per cent. This could well be adopted generally.

SUMMARY

1. A fatal case of potassium chlorate poisoning by 30 to 35 grams (450 to 525 grains), with death resulting in 9 days after the initial dose or 5 days after the last dose, is described.

2. The symptoms, action, autopsy findings and possible treatment are discussed.

3. The dangers of the use of potassium chlorate are emphasized.

We are indebted to Dr. E. Gordon Young, Professor of Biochemistry, Dalhousie University, Halifax, N.S., for the chemical analysis, and to Dr. Rudolf Hack, Corner Brook, Newfoundland, for some of the clinical data.

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ATHLETES AT FEVER HEAT.—Athletes in severe muscular exercise can show body temperatures that normally would mean high fevers, Dr. Eugene F. DuBois, of the Russell Sage Institute of Pathology, Cornell University Medical School, believes. Dr. DuBois, reviewing studies of the body's temperature, showed that the familiar 98.6 degrees Fahrenheit the clinical thermometer registers normally is only one single spot between internal temperature and skin temperatures of 93.2 and lower. In severe exercise the temperature may run up to 104 degrees Fahrenheit. Just as the earth has broad zones of temperature so, too, does the body have its temperature levels, or zones. The torrid zone in man might be classed as that with temperatures of more than 105.2 degrees F. which can only be obtained by artificial fevers or when the body's temperature-regulating mechanism fails. Just below this, in what might be called the semi-tropics, is the familiar "fever" zone that is higher in temperature than normal and which comes from illness. With fever the skin temperature is warm. Here, too, come the higher temperatures of severe exercise which are accompanied, however, by cool skin. The body's normal temperature zone, corresponding to the temperate zone on the earth, is fairly wide. Below it come those body temperatures which are restored to normal values by shivering. And finally, analogous to the polar regions on earth, is the body's zone of semi-hibernation where temperature regulation fails.—*Science News Letter*, November 11, 1939.

ANURIA CAUSED BY SULFAPYRIDINE THERAPY*

(REPORT OF A CASE SUCCESSFULLY TREATED BY OPERATION)

BY EMERSON SMITH, KENNETH A. EVELYN AND JOHN F. NOLAN

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WHEN sulfapyridine is ingested a variable fraction, usually about 50 per cent, is excreted unchanged, while the remainder appears in the urine as the relatively insoluble monoacetyl derivative. Several investigators[1, 2, 3] have shown that acetylsulfapyridine may crystallize out in the urine of rats, rabbits, and monkeys with the formation of renal calculi, while others[1, 4 to 13] have reported similar findings in man. The occurrence of gross or microscopic hæmaturia associated with the presence of acetylsulfapyridine crystals in the urine is therefore being recognized as a not uncommon complication of sulfapyridine therapy. Some of the cases of hæmaturia go on to anuria with nitrogen retention and even death, the following being a summary of those in which definite anuria or oliguria has been reported.

Southworth and Cook[6] reported three cases of hæmaturia, one of which was a forty-year old man suffering from broncho-pneumonia who developed hæmaturia, abdominal pain, and anuria after having received 25.5 g. of sulfapyridine. No crystals were found in the urine, and the patient recovered on conservative treatment after fourteen hours of anuria. Long and Wood[10] reported six cases of hæmaturia, one of which was in a patient ill with lobar pneumonia, who developed oliguria after six days of treatment (amount of sulfapyridine not stated), and died within thirty-six hours. At autopsy, crystals and calculi of acetylsulfapyridine were found in both renal pelves and ureters. Tsao *et al.*[11] reported from Shanghai five cases of hæmaturia in children, one of whom was an eight-year old boy suffering from generalized tuberculosis, who developed hæmaturia and anuria after receiving 7.26 g. of sulfapyridine in sixty hours. This patient died, and at autopsy bilateral ureteral obstruction was found to be due to agglomerations of crystals which were almost certainly acetylsulfapyridine, although they were not positively identified. Brown *et al.*[12] reported six cases of oliguria and three of anuria. Details of all the cases were unfortunately not given, but one was a nineteen-year old boy suffering from staphylococcal pneumonia and pyæmia, who was moribund on admission and became anuric after having received a total of 15.2 g. of sodium sulfapyridine intravenously. At autopsy crystals of acetylsulfapyridine were found within the tubules of the kidneys. Kilgour[13] has recently reported three cases of hæmaturia, one of which developed bilateral renal colic, oliguria, nitrogen retention, œdema, and hypertension after having received a total of 30 g. of sulfapyridine. This patient eventually died of a lung abscess, and at autopsy a severe diffuse nephritis was found, but no crystals were seen. The possibility of serious renal damage resulting from sulfapyridine therapy apart from the formation of calculi lacks confirmation at the present time.

The case of renal colic and anuria caused by sulfapyridine therapy which is reported in this paper is of interest not only because it is important that further attention should be called to this serious and potentially fatal complication, but also because we have not been able to discover in the literature any report of a similar case successfully treated by operation.

CASE REPORT

D.K., a white male, aged 19 years, was admitted on November 2, 1939, with a tentative diagnosis of ruptured gastric ulcer or acute pancreatitis.

Complaint.—Severe abdominal pain situated in the epigastrium just above the umbilicus.

Personal history.—Unimportant except for a history of hæmaturia of two weeks' duration following a swimming accident in December, 1937.

Present illness.—On October 4th the patient developed an acute gonococcal urethritis for which he was treated in a military hospital. He received 39 g. of sulfapyridine during a period of 23 days. The discharge stopped after 22 days. On October 24, 1939, the patient received his first dose of diphtheria antitoxin. Following this his arm became reddened, hot and sore, and he developed general malaise, these symptoms lasting three days. On October 27th, he received a second dose. He developed pain, stiffness and general malaise, and ran a temperature of between 101 and 102° F. He was then admitted to the Royal Victoria Hospital complaining of pain in the right side of the chest anteriorly. He had taken sulfapyridine until the day of admission. It was noted

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Read before the Montreal Medico-Chirurgical Society, December 15, 1939.

that he again had an urethral discharge containing gonococci, and he was placed on neo-sulfanilamide, 1.0 g. three times a day. In all he received 9.0 g. His temperature was normal the next day, and he was feeling much better. Physical signs and x-ray of the chest were negative. Blood pressure, 120/80. He remained in the hospital for four days and was discharged to the Military Hospital on November 1st, where he was again started on sulfapyridine. He received 3.0 g. in the next thirty-six hours.

At 4 a.m. on November 2nd, he was awakened by a severe pain in the epigastrium. This was accompanied by nausea and vomiting. He was seen by his medical officer and an enema was given that was ineffectual. Later in the morning his bowels moved twice. During the next few hours the pain became more severe; he vomited small amounts of bile-stained material every half-hour, and was unable to retain anything taken by mouth. He was re-admitted to the Royal Victoria Hospital at 4 p.m., his chief complaints being severe epigastric pain, nausea and vomiting. He had voided an apparently normal amount of urine just before admission.

Physical examination showed a well developed nineteen-year old male, lying in bed on his right side with his knees flexed. On admission his temperature was 98.4° F., pulse 100, and respirations 22. Positive findings were epigastric tenderness situated immediately above the umbilicus, and marked muscle spasm of the upper half of the abdomen. The lower half was not splinted nor tender. The point of maximum tenderness was in the epigastrium. Heart and lungs were negative. Blood pressure 156/95.

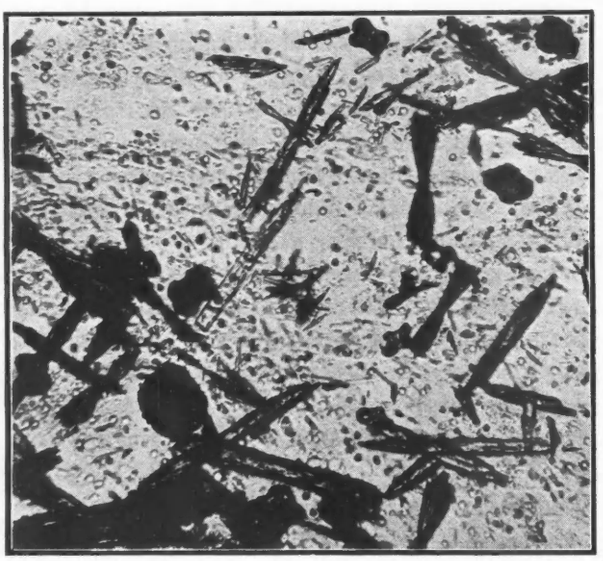

Fig. 1.—Acetylsulfapyridine crystals as described above.

There was moderate costo-lumbar tenderness on both sides. The kidneys were not palpated. No tenderness was noted along the course of ureters; no suprapubic tenderness nor masses felt. The scrotum and contents were normal. No urethral discharge. Prostate per rectum normal. The white blood cell count was 12,000. The remainder of the physical examination was negative.

Four hours after admission the patient succeeded in voiding 10 c.c. of bloody urine. This contained red blood cells, and a large number of needle-shaped brownish crystals with a tendency to arrange themselves in sheaves and cruciate shapes (Fig. 1). Occasional almost amorphous spherical aggregates were observed. After repeated washing and drying (but before re-crystallization) the crystals had a melting point of 223° C., which agrees with the figures given by previous authors[1, 2, 3, 10, 11, 14]. On chemical analysis by the usual Marshall colour reaction the crystals were found to consist of 85 per cent acetylsulfapyridine. The material was also re-crystallized from 6N acetic without appreciable change in the melting point or the percentage of acetylsulfapyridine. The concentration of free sulfapyridine in the blood was 4.5 mg. per cent, and in the urine only 35 mg. per cent, indicating the great extent to which the drug must have been acetylated by this patient.

After identifying the crystals and establishing the diagnosis of urinary obstruction (most likely ureteral) because of the absence of a palpable bladder or tenderness over the pubes, an intravenous of 2,000 c.c. of 10 per cent glucose saline was given. Heat in the form of poultices was applied to both kidney regions, and a baker was placed over the patient. Morphia, gr. ¼, was given for pain. During the night he voided 30 c.c. of urine. Nausea and vomiting continued, and the patient was unable to retain any liquids. The following morning the pain in the epigastric region was gone and he was now complaining of extreme pain in the back. There was very marked bilateral costo-lumbar tenderness. The blood non-protein nitrogen was 53 mg. per cent, and the creatinine 2.5 mg. per cent at 8 a.m. At 2 p.m. the patient was catheterized and no urine obtained. At 6 p.m. (26 hours after admission), as the patient had voided only 40 c.c. of bloody urine, a urological investigation was done.

Cystoscopic examination showed a stricture in the mid-penile urethra which was dilated to 22 F.; cystoscope F. 21 was introduced with ease. The bladder was not inflamed. Both ureteral orifices were markedly œdematous and gaping, and protruding from each orifice was a crystalline material of the consistency of fine mortar. Some of this ureteral material was dislodged with the ureteral catheter. Repeated attempts to catheterize the ureters were unsuccessful. The catheters could be introduced for about half an inch. X-ray of kidneys, ureters and bladder area, and with catheters at point of obstruction in ureters, showed no evidence of calculi.

Diagnosis.—Bilateral ureteral obstruction due to acetylsulfapyridine crystals. In view of these findings immediate operation was decided upon.

The left kidney was exposed and was markedly enlarged, tense and congested. The renal pelvis was distended to about four times its normal size, and when the pelvis was incised there was a gush of clear yellow urine under marked pressure. Digital exploration of the pelvis did not reveal any crystalline material. A number F. 11 bougie was inserted down the ureter to the bladder. Decapsulation was done and the wound closed with a rubber tube drain in position.

The right kidney was then exposed with similar findings, except that the ureter and pelvis were more distended than on the left, and filled with bloody urine. A specimen of this was obtained, and examination later showed red blood cells and similar crystals to those previously described. A number F. 11 bougie was inserted down the ureter to the bladder. Decapsulation was done, and the wound was closed with rubber tube drain in position. The patient returned to bed in good condition.

Diary.—Four hours after operation the patient voided six ounces of bloody urine. Large amounts of urine drained from both loin wounds for the first two days. This drainage gradually diminished and normal voiding was resumed. The blood pressure, which was 156/95 six hours before operation, returned to normal in three days, and remained there during the period of hospitalization. The blood chemistry which was elevated the day of operation, also returned to normal in three days. The patient made an uneventful recovery, and was discharged from hospital on November 25, 1939.

DISCUSSION

Long and Wood[10] state that crystals of acetylsulfapyridine can be seen in the urine of all patients receiving sulfapyridine by mouth, and that there is no correlation between the number of crystals and the occurrence of hæmaturia. Moreover, the formation of gross calculi would seem to be due to an individual idiosyncrasy, since several of the most severe cases have received relatively small amounts of the drug. For example, one case reported by Tsao *et al.*[11] developed anuria after only 7.25 g. given in 20 hours. There can be little doubt, however, that one of the factors which tends to increase the likelihood of calculus formation is reduction of fluid intake either voluntarily or as a result of uncontrolled vomiting. There is some theoretical reason to believe that calculus formation would tend to be inhibited in alkaline urine, but in practice the administration of sodium bicarbonate does not seem to have been a satisfactory prophylactic. Three of the five cases reported by Tsao *et al.* had received sodium bicarbonate, and the urine in our case was alkaline. However until more is known about the mechanism of formation of these calculi it would seem reasonable to continue the use of sodium bicarbonate, although it might be mentioned in passing that the original reason for the use of this drug (the belief that sulfapyridine causes an acidosis) has now been shown to be erroneous.

Certain other precautions may be of value, especially those directed toward maintaining an adequate fluid intake throughout the period of sulfapyridine therapy. If hæmaturia, renal colic, or oliguria occur the drug should be discontinued immediately, and fluids given by the intravenous route. The intake and output should be charted, and the blood non-protein nitrogen determined. Continuation of sodium bicarbonate administration, and application of heat to the loins may be of value. As soon as anuria appears an attempt should be made to relieve the obstruction by ureteral catheterization, and if this fails bilateral pyelotomy with retrograde ureteral dilatation, and if necessary decapsulation of the kidneys should be done. The appearance of the kidneys at operation in our case illustrates the possible danger of forcing fluids without relieving the obstruction, since there is a definite risk of causing cessation of renal excretion by allowing the intra-ureteral pressure to rise too high. From our experience with this case we suggest that in similar cases earlier attempts at ureteral catheterization should be made, hoping to avoid the radical surgery that was necessary here.

SUMMARY

1. Following the administration over a period of four weeks of sulfapyridine, g. 42, and neosulfanilamide, g. 9, anuria developed due to complete bilateral ureteral blockage with acetylsulfapyridine crystals.

2. Bilateral pyelotomy, decapsulation, and retrograde ureteral dilatation were done, with complete recovery.

3. The pre-operative blood pressure was 156/95; following operation the blood pressure dropped to 120/80, and remained there during the patient's hospitalization.

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THE TOXIC EFFECTS OF SULFANILAMIDE AND RELATED COMPOUNDS*

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THIS discussion is based chiefly on studies of 420 adult patients treated with either sulfanilamide or sulfapyridine in the wards of the Montreal General Hospital. I will confine my remarks almost entirely to these two drugs since our experience with other compounds has been very limited.

Before discussing the toxicity of these drugs I wish to remind you that in some instances toxic effects may be produced not only by the drug but also by some other toxic substance which has been added for one purpose or another. The best known example of this is the "elixir of sulfanilamide" in which highly toxic diethylene glycol was included as a solvent. Another example is the strongly alkaline solution of the sodium salt of sulfapyridine. We have found this preparation to be very useful when suitably diluted and administered intravenously. However, under certain circumstances, the strong alkali which it contains may produce serious toxic effects. Thus, I have seen two cases, both outside the hospital, in which subcutaneous injection of a 39 per cent† solution of the sodium salt produced extensive sloughing, and one case, also outside the hospital, in which subarachnoid injection by cisternal puncture of a 15 per cent† solution caused a subarachnoid block and paralysis of one facial nerve.

With regard to the toxicity of the drugs themselves, it is well known that sulfanilamide and related compounds may produce a wide variety of toxic effects. The toxic effects of the different compounds are very similar. Thus, in our experience, almost every toxic effect encountered with the use of sulfanilamide has also been observed in patients receiving sulfapyridine. These effects are, in general those met with in poisoning by aniline and its derivatives. This is to be expected, since all these compounds are closely related chemically to aniline. Not only are the toxic effects of the different compounds very similar but also patients who show an idiosyncrasy to one of these drugs may subsequently show the same idiosyncrasy to another related form. This is illustrated by one of our cases in which administration of sulfapyridine produced a sharp febrile reaction within twelve hours after the first dose; the temperature became normal when the drug was discontinued, and subsequent administration of sulfanilamide produced a similar febrile reaction.

On the other hand, as is to be expected, relatively minor differences in the chemical structure of these compounds are associated with certain differences in toxicity. Thus sulfanilamide often causes nausea and vomiting but these are rarely severe. Sulfapyridine, in which pyridine is attached to the sulfanilamide molecule, produced intense nausea with vomiting in about 90 per cent of our cases; vomiting may occur even with intravenous administration of the drug. It is of interest to note that this difference in toxicity is due to the introduction of the pyridine group. One of the chief toxic effects of pyridine itself is vomiting. Another example of difference in toxicity is found in experiences with peripheral neuritis. This complication occurs chiefly with use of the disulfanilamides and only very rarely with other compounds.

For practical purposes the toxic effects of these compounds are classified as major and minor. The major toxic effects are those which may endanger life (*e.g.*, agranulocytosis) or produce serious disability (*e.g.*, peripheral neuritis). The important major toxic effects are as follows: acute hæmolytic anæmia, agranulocytosis, peripheral neuritis, toxic hepatitis, exfoliative dermatitis and severe methæmoglobinæmia and sulphæmoglobinæmia. To these must be added the renal disturbance sometimes produced by sulfapyridine. The minor toxic effects are not listed since they will not be discussed in detail in this paper. However, special reference must be made to one minor toxic effect, namely, fever. Long and others have noted that fever occurs as an initial sign in almost every case in which a serious toxic effect such as hepatitis, acute

* From the Department of Metabolism, the Montreal General Hospital, Montreal, Canada. An address delivered at the annual meeting of the Royal College of Physicians and Surgeons, Ottawa, October 28, 1939.

† Concentrations expressed in terms of the sodium salt of sulfapyridine, containing one molecule of water of crystallization.

hæmolytic anæmia, or agranulocytosis is encountered. Therefore, although fever is in itself a minor toxic effect it should be regarded as a warning signal that a major toxic effect may occur.

INCIDENCE OF MAJOR TOXIC EFFECTS AMONGST 420 CASES TREATED WITH SULFANILAMIDE AND SULFAPYRIDINE

Of the 420 cases on which this discussion is based 305 were treated with sulfanilamide and 115 with sulfapyridine. There were no deaths due to either of the drugs. Major toxic effects were met with in 8 cases. These were as follows: 2 cases of agranulocytosis due to sulfapyridine, 2 cases of severe methæmoglobinæmia due to sulfanilamide, and 4 cases of a severe renal disturbance due to sulfapyridine.

PRECAUTIONS OBSERVED IN THE USE OF SULFANILAMIDE AND SULFAPYRIDINE

Excluding the cases of renal disturbance due to sulfapyridine, which will be discussed in detail later, our incidence of major toxic effects was low, and, in addition, those cases in which major toxic effects did occur eventually made a satisfactory recovery. It is therefore appropriate to discuss briefly the precautions which we observed in the use of these drugs. The more important of these were as follows.

1. Frequent estimations of the concentration of the drug in the blood were made. In general, the concentrations used in treatment were about 5 mg. per cent in mild infections and about 10 mg. per cent in severe infections. Concentrations higher than 15 mg. per cent were avoided, the dosage being reduced if this level was exceeded.* This precaution is especially important in cases of renal failure when excretion of the drug may be impaired.

2. When drug fever was recognized, that is, when the fever could not be accounted for by infection, use of the drug was discontinued, except in cases in which the life of the patient depended on continuing the treatment. This is of importance, since fever may be the initial sign of a more serious toxic effect. In our two cases of agranulocytosis due to sulfapyridine the fall in white count was accompanied by a marked febrile reaction which could not be accounted for by infection.

3. Administration of these drugs over a period of two weeks or more was avoided unless the nature of the infection obviously justified prolonged treatment. This precaution was taken because of the danger of agranulocytosis when therapy is prolonged. In the majority of reported cases this complication has followed the use of large doses (40 grams or more) over periods of two weeks or longer; agranulocytosis rarely occurs with shorter courses of treatment. Our experiences are in accord with this. In our two cases of agranulocytosis due to sulfapyridine the fall in white count occurred after administration of 55 grams in 14 days and 94 grams in 21 days, respectively.

4. Frequent spectroscopic examinations of the blood for methæmoglobin and sulphæmoglobin were made. The amount of abnormal pigment was estimated approximately by noting the intensity and width of the charateristic absorption bands.

Methæmoglobinæmia was found in 114 of the 420 patients receiving sulfanilamide or sulfapyridine. In the majority of cases it was mild. When severe it was readily overcome by reducing the dose of the drug, except in two cases. In these reduction of dosage was inadvisable because of the progress of infection for which the drug was used. Methæmoglobinæmia became unusually severe and anoxæmia was further increased by pneumonia and severe anæmia. Both were successfully treated by blood transfusions, and, in one case, also by intravenous administration of methylene blue. This is the only case in which methylene blue was used.

Sulphæmoglobinæmia was met with in three cases only; it was mild and required no treatment.

5. There are a number of other precautions which will not be discussed in detail because their importance is obvious. These include red cell counts and estimations of the hæmoglobin content of blood, to detect the onset of acute hæmolytic anæmia, estimations of the bilirubin content of plasma, to detect the onset of either acute hæmolytic anæmia or toxic hepatitis, and white cell counts, to detect the onset of agranulocytosis. In the use of these precautions, the following facts should be borne in mind: (1) acute hæmolytic anæmia usually commences within the first twenty-four to seventy-two hours of therapy; (2) agranulocytosis usually commences after two weeks of therapy, and (3) all three complications — acute hæmolytic anæmia, agranulocytosis and toxic hepatitis—are usually preceded or accompanied by fever.

* These figures refer to the free forms of the drugs.

RENAL COMPLICATION IN CASES TREATED WITH SULFAPYRIDINE

The most disturbing feature of our experiences was the occurrence of a severe renal complication in 4 of the 115 patients receiving sulfapyridine. This complication was characterized by gross hæmaturia with variable amounts of pus and few or no casts, oliguria, œdema, nitrogen retention, and abdominal pain of the type met with in cases of renal calculi.* In two cases these signs and symptoms disappeared within a few days after discontinuing the drug. In the other two they were more persistent; in one they were still present on discharge from hospital sixteen weeks after discontinuing sulfapyridine, and in the other they persisted until the patient died three weeks after the drug was stopped.† This renal complication has also been reported by others. It should here be noted that this toxic effect has been encountered in the cases receiving sulfapyridine only; it was not observed with the use of sulfanilamide.

The cause is not known. Several investigators have shown that administration of large doses of sulfapyridine to experimental animals leads to precipitation of the relatively insoluble acetyl-sulfapyridine from the urine, with formation of calculi, urinary obstruction, and the later development of pyelonephritis. Formation of calculi containing a large proportion of acetyl-sulfapyridine has also been demonstrated in human subjects. We have no evidence that this occurred in our cases. Post-mortem examination of the case in which the renal complication was still present at the time of death showed an acute glomerulo-nephritis with no evidence of renal calculi or urinary obstruction. Although this finding is suggestive, it cannot be regarded as proof that sulfapyridine causes acute nephritis; the renal lesion may have been secondary to the infection which led to death. However, the occurrence of acute nephritis in patients receiving sulfapyridine has also been reported by others. It is therefore possible that sulfapyridine may cause renal damage in two ways: (1) by acting as a renal irritant and producing an acute nephritis and (2) by precipitation of acetyl-sulfapyridine in the urinary tract, with urinary obstruction and later development of pyelonephritis. Prevention of this complication cannot be adequately discussed until more is known of its cause. However, two aspects of prevention may be mentioned at the present time, namely, avoidance of high dosages of sulfapyridine and alkalinization of the urine.

* In addition to these four cases there was also one showing transient gross hæmaturia, without other signs or symptoms, during sulfapyridine therapy.

† In the last case death appeared to be due not to the renal complication but to the infection for which the drug was given (pneumonia, lung abscess, and empyema).

THE DOSAGE OF SULFAPYRIDINE

In three of our four cases the dosages of sulfapyridine were no higher than those used in other cases which showed no hæmaturia. It should also be noted that these dosages were much smaller than those which lead to formation of renal calculi in experimental animals. In the fourth case, however, an unusually high dosage appeared to be a causative factor. This patient received an average daily dose of 184 grains for four days preceding the onset of hæmaturia. This was equivalent to 0.27 grams per kilogram of body weight per day. More than one-half of this dose was given intravenously as the sodium salt. The drug was discontinued, and, after the hæmaturia and other signs had disappeared a much lower dosage of sulfapyridine was given for 34 days without recurrence of the hæmaturia. It is of interest to note that renal calculi have been produced in monkeys by administration of 0.25 grams of sulfapyridine per kilogram per day for 10 days. In the case of the patient cited a similar dose (0.27 grams per kg. per day) was given over a shorter period (4 days).

ALKALINIZATION OF THE URINE

Long and Bliss suggested that alkalinization of the urine might prevent this complication by increasing the solubility of sulfapyridine and its acetyl derivative, thus preventing their precipitation. This suggestion is, of course, based on the assumption that the renal disturbance is caused by precipitation of the drug in the urinary tract. We have determined the solubility of both free and conjugated sulfapyridine in phosphate buffer solutions ranging in pH from 5.4 to 8.2 (8.2 is the maximum pH which can be obtained in urine). Changes in solubility as the alkalinity increased appeared to be too small to make alkalinization effective in preventing precipitation of the drug from the urine.

THE TOXICITY OF CONJUGATED FORMS OF SULFANILAMIDE AND SULFAPYRIDINE

It has been shown that a part of the sulfanilamide or sulfapyridine is conjugated in the body with acetic acid to form an acetyl derivative.

Analyses of blood and other body fluids have shown considerable variation in the proportion of the drug which is conjugated. Relatively high concentrations of the conjugated form are occasionally met with, especially when excretion of the drug is impaired owing to renal failure.

Little is known concerning the toxicity of these acetyl derivatives. Their chemical structure, as well as experiences with other types of conjugation in the body, suggest that conjugation is a detoxifying mechanism by which the relatively toxic free forms of the drugs are converted into less toxic conjugated forms. However, Marshall, Emerson and Cutting found that acetyl sulfanilamide was actually *more* toxic to experimental animals than free sulfanilamide. They suggested that attention should be paid to the possible toxic effects of the conjugated form in human subjects, especially when relatively high concentrations are present.

We have approached this problem by studying the relationship between the occurrence of methæmoglobin and the proportion of the drug present in the blood in the conjugated form. The findings are shown in Tables I and II. It will be noted that although the incidence of methæmoglobinæmia increases with the total concentration of the drug in the blood there is also a relationship between methæmoglobin formation and the proportion of the drug in the conjugated form. When the conjugated form accounts for less than 25 per cent of the total drug methæmoglobinæmia is much more frequent than when more than 25 per cent is conjugated. These findings indicate that, at least with respect to ability to form methæmoglobin, conjugation reduces toxicity.

TABLE I.

SHOWING THE RELATIONSHIP BETWEEN THE OCCURRENCE OF METHÆMOGLOBIN AND THE PROPORTION OF SULFANILAMIDE IN CONJUGATED FORM IN THE BLOOD

Total sulfanilamide (mg. per 100 c.c. blood)	*–25% in Conjugated form*			*25% + in Conjugated form*		
	No. of tests	*Methæmoglobin present*		*No. of tests*	*Methæmoglobin present*	
		No.	*Percentage*		*No.*	*Percentage*
–5.0	62	14	22.6	53	4	7.5
5.1–10.0	133	34	25.6	86	15	17.4
10.1+	67	28	41.8	32	7	21.9

TABLE II.

SHOWING THE RELATIONSHIP BETWEEN THE OCCURRENCE OF METHÆMOGLOBIN AND THE PROPORTION OF SULFAPYRIDINE IN CONJUGATED FORM IN THE BLOOD

Total sulfapyridine (mg. per 100 c.c. blood)	*–25% in Conjugated form*			*25% + in Conjugated form*		
	No. of tests	*Methæmoglobin present*		*No. of tests*	*Methæmoglobin present*	
		No.	*Percentage*		*No.*	*Percentage*
–7.0	47	4	8.5	135	1	0.7
7.1+	70	22	31.4	65	8	12.3

SUMMARY

Provided the precautions described are observed, sulfanilamide therapy is a relatively safe procedure. Major toxic effects are infrequent and can be successfully treated if detected early before permanent damage has been done.

On the other hand, in view of the possibility that sulfapyridine may lead to severe and perhaps permanent renal damage, treatment with this drug must be regarded as potentially dangerous, even when all known precautions are observed in its use.

The results of studies of methæmoglobin formation support the view that the acetyl derivatives of sulfanilamide and sulfapyridine are less toxic than the free forms of the drugs, and that conjugation is a detoxifying mechanism.

A practical way of causing yeast cells to manufacture fat from sugar and other carbohydrates may be brought closer to realization by experiments reported by Dr. Theodore J. B. Stier of Harvard's Biological Laboratories. Knowledge of the intracellular processes of human tissues may also be advanced markedly as a result of his studies on the allied cell-life of baker's yeast. Particularly significant is his finding that yeasts deficient in vitamin B fall behind in production and storage of animal starch or glycogen. The tests reported are the first ever made in which yeast cells have been kept in an alcohol or sugar bath of constant concentration, an important factor if any implications are to be drawn for the animal cell. The research dealt quantitatively with the diet of yeast cells and their manufacture of glycogen and fat. For this reason it may also help future perfection of a yeast process for making fats, first utilized by Germany during the World War. Dr. Stier has confirmed previous findings that yeast forms fat when fed sugar or alcohol. He found that alcohol aids conversion of its stored carbohydrate to fat and that more fat is stored on a diet of both alcohol and sugar. Yeast without food or oxygen goes into suspended animation. This discovery may permit storage of yeast. He found that the concentration of vitamin B falls if yeast is deprived of food but not oxygen. Ability to produce this deficiency may be useful experimentally. Starved yeast cells fed glucose but no oxygen, store glycogen and produce much alcohol but little fat. —*Science News Letter*, July 29, 1939.

ANGINA PECTORIS: A CASE STUDY*

BY E. P. SCARLETT

Calgary

IT is evident from a survey of the medical literature of the last five decades that the attempt to secure an adequate clinical content for the term "angina pectoris" has met with three outstanding difficulties, confused definition, failure to agree upon the pathogenesis, and the difficulty of an intelligent prognosis in the individual case. Recent years have seen notable progress in the clarification of these matters. This has been due in large part to the increasing knowledge of coronary artery problems. There is a better general understanding of what is meant by the term. Angina pectoris can no longer be viewed as a loose expression to denote the symptom of pain in the chest. The greater knowledge of the etiology of such pain has served to differentiate such conditions as coronary thrombosis, syphilis of the aorta, and rheumatic heart disease, thus permitting a more accurate definition of the term. In regard to the pathogenesis of the syndrome, although the last word has not been said, the coronary origin of the disorder is now generally accepted. And although the prognosis in the individual case must always be relatively uncertain, a broader viewpoint in this particular has been achieved. In short, the term "angina pectoris" is less a symptom than it was ten years ago. It may now be regarded as a syndrome capable of definition clinically, with a pathological basis generally agreed upon. This has served in large measure to free physician and layman alike from the tyranny of a term which in the past was inadequately understood.

What do we mean by "angina pectoris"? In a summary way it may be defined as follows: (1) Angina pectoris is a disease of the heart manifested by pain on exertion, such pain being experienced across the chest, usually in the region of the sternum, sometimes radiating, and, if so, most commonly to the arms. (2) It is a symptom-complex or syndrome of coronary artery disease, and is due to deficient coronary blood supply, the pain arising from ischæmia due to localized arterial spasm. (3) Angina pectoris is the condition which arises when the ischæmia is transient. If the ischæmia should be permanent and infarction of the myocardium result the resulting condition is known as coronary thrombosis. There is thus the link of a common pathogenesis between the two conditions. The difference lies in the degree of the primary disturbance.

It is interesting to note that, in the concept of angina pectoris, the relation of exercise and pain has been recognized since the days of Heberden. And also since the observations of Jenner, English authors have suspected the relation of angina pectoris and the coronary vessels. The final recognition of the essential unity of angina pectoris and coronary thrombosis is one of the substantial achievements of our time.

Whether in the light of such definition the concept of angina pectoris rests upon a satisfactory basis is a matter of opinion. Certainly we have not reached the point at which the term may be discarded. It is obvious, too, that the symptom-complex which the term embraces by whatever definition is a serious condition and one of common occurrence. Studies indicate that patients with angina pectoris due to all causes comprise a large percentage of all patients over twenty years of age with cardiovascular disorders: in America 12.5 per cent (White), in Germany 8.1 per cent (Koller), in Poland 12 per cent (Semerau-Siemianowski).

This paper is based on a statistical study of 100 cases of angina pectoris seen in office and consultation practice, selected only so far as the diagnosis was definite and full diagnostic material was available, including electrocardiogram, heart plate, and Wassermann reaction. In all cases we have been able to follow the subsequent course. The following conditions have been excluded: effort pain appearing after coronary thrombosis, rheumatic heart disease, pain due to syphilis of the aorta. I do not pretend to base any far-reaching statistical analysis on such a small series of cases. Figures however have a qualitative value, and

* Read at the Seventieth Annual Meeting of the Canadian Medical Association, Section of Medicine, Montreal, June 21, 1939.

an analysis of this sort may aid us in thinking more clearly about the characteristics and course of Heberden's angina.

The diagnostic criteria of angina pectoris which have been employed are as follows: (1) the sudden onset of distress; (2) distress of short duration—usually less than ten minutes; (3) the distress experienced is a pain or pressure or choking sensation; (4) the sternal region is involved, with or without radiation, usually to the arms; (5) the attack is precipitated by exertion. The distress usually bears a quantitative relation to exertion, particularly exertion after meals. We have seldom found that pain occurred as the result of severe emotion. (Is this because we experience no great emotion in these days?)

Sex and age.—The essential data are given in Chart 1. The ratio of men to women was more than 5 to 1. The range of age at onset was from 32 to 74 years; 64 per cent of the cases began between the ages of 50 and 65; 64 per cent developed after the age of 55. The characteristics of the disease were the same in both sexes.

Mortality and age-incidence (Table I).—It is to be noted that nearly one-half of the patients attained the age of 60 or over, the present

SEX AND AGE: AGE AT ONSET

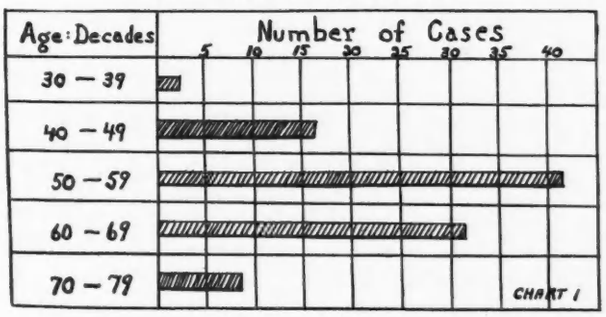

Chart 1.—Men 85; women 15. Average age: men, 57.4 years; women, 57.3 years. Range of ages: 32 to 74 years.

TABLE I.
MORTALITY AND AGE-INCIDENCE

Patients dead: 40 Alive: 60
Deaths: male 35 female 5
Average age at death:
Male: 64 years
Female: 56 years

DEATHS: *Age (years)*	*Number*	*Percentage of patients dead*	*Percentage of all patients*
30–39	1	2.5	2
40–49	6	15.0	16
50–59	13	32.5	42
60–69	16	40.0	31
70–79	4	10.0	9

expectancy of life. In this series age would appear to have no bearing on prognosis, there being a fairly constant relationship between the percentage of patients who died and the percentage of patients in each group.

DURATION OF DISEASE IN FATAL CASES

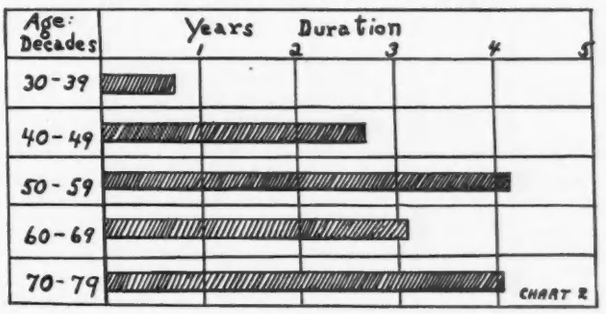

Chart 2.—Average duration: 3.5 years. Range of duration: 1 month to 10 years.

TABLE II.
DURATION OF DISEASE IN SURVIVING CASES

Average duration from time of first attack: 4.6 years

Duration (years)	*Less than 1 year*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*13*
Number of cases	3	14	6	14	4	3	3	5	4	2	1	1

The duration of disease (Chart 2 and Table II).—The average duration of life after angina has developed was found in this series to be three and a half years. Other studies (Mackenzie, Herrick, White and Bland) have shown a duration of from four to five years. In general however it may be said that the period of survival is practically what would be expected for a similar group of patients without angina but with evidence of cardiovascular disease. The average duration of angina in the group of surviving cases is shown in Table II.

The location and radiation of distress (Table III).—In 82 per cent of the cases the discomfort occurred in the substernal region. Other observers have found the percentage ranging from 83 to 89. The rarest site is the region of the cardiac apex, an observation which is of value when it is recalled that this is the most common site of the pain complained of in cases of cardiac neurosis or chronic fatigue. It would seem therefore that we should speak of the pain of angina pectoris as being "substernal" rather than "præcordial". So far as could be determined an identical area was involved in each attack. Thirty per cent of the patients noted that attacks were induced more readily by walking in the cold or against

a cold wind. Two other observations are of interest. No patient noted the sensation of impending death during an attack, and it was relatively infrequent that a patient appeared to be unnerved by the attacks. This last observation is in marked contrast to the anxiety experienced by the patient with cardiac neurosis.

TABLE III.

LOCATION AND RADIATION OF PAIN DURING ANGINAL ATTACKS

Location	*Percentage*
Substernal	82
Epigastrium	10
Upper half left chest	4
Right mammary region	2
Apex of heart	2
Radiation	
Both arms	22
Left arm	18
Right arm	3
Neck and jaws	13
Back	2
No radiation	42
Aggravated by cold	30

Physical examination (Table IV).—Hypertension (greater than 150 mm. Hg. systolic or 96 mm. Hg. diastolic) was found in 37 per cent of the cases. Extreme hypertension was rare. Eighteen of the 40 patients who died had hypertension, as opposed to 19 of the 60 patients still alive. The incidence of hypertension in women was much greater than in men, an observation which is in accord with the findings of Eppinger and Levine. Of the 15 women with angina pectoris, 12 had hypertension, the average reading for the group being 181 systolic and 110 diastolic. This means that one should hesitate to make a diagnosis of angina pectoris (unassociated of course with coronary thrombosis) in a woman with low blood pressure.

Cardiac enlargement was not a notable feature, 29 per cent only showing this. The cardiac findings were not at all significant. It has long been recognized that even in severe angina pectoris no abnormalities may be detected by any method of examination. Seventeen per cent of the patients in the present group came within this category.

Obesity was not a significant factor. Diabetes played little part in these cases. The finding of local hyperæsthesia over the chest was uncommon. In this series there were no cases of congestive failure, auricular fibrillation or mitral stenosis.

TABLE IV.

PHYSICAL FINDINGS IN ANGINA PECTORIS

A.	Hypertension (over 150/96): 37 cases; 19 patients living; 18 patients dead. Systolic pressure over 200 mm. Hg. or diastolic over 140: 6 cases.	
B.	Cardiac findings:	*Cases*
	Poor quality cardiac sounds	15
	Loud systolic blowing murmur	14
	Ringing aortic second sound	9
	Rough aortic systolic murmur	4
C.	Cardiac enlargement: 29 cases.	
D.	Normal blood pressure, heart size, cardiac findings and electrocardiogram: 17 cases.	
E.	Obesity—patients overweight: 21 per cent.	

The electrocardiogram (Table V).—The electrocardiographic findings offer of course no positive aid to diagnosis. With respect to prognosis however two observations are of importance. While the finding of a normal curve is not necessarily a good prognostic sign, it carries with it a better prognosis. Of the patients with a normal electrocardiogram 23 per cent died while 48 per cent of those with an abnormal electrocardiogram died. And while no definite correlation between the type of abnormality and prognosis is possible in a series of this extent, it may be said that negativity of the T wave in lead I or leads I and II is an unfavourable sign. The majority of the patients who died showed this electrocardiographic change. Similarly extreme abnormalities such as bundle branch block have an unfavourable prognostic value.

TABLE V.

THE ELECTROCARDIOGRAM AND ANGINA PECTORIS

	Cases (percentage)	*Died (percentage)*
Normal electrocardiogram	25	23
Abnormal electrocardiogram	75	48
Changes present		*Cases*
Pathological Q3		22
"Cove plane"		13
Notched Q.R.S. (2 or all leads)		16
T wave changes:		
Flattened lead I		5
Inverted lead I		11
Inverted lead II		5
Inverted leads I and II or all leads		14
Flattened or diphasic all leads		5
Low voltage Q.R.S. all leads		1
R.S.T. interval changes		11
Bundle branch block		3
Marked left axis deviation (only abnormality)		11

Mode of death.—Fifty per cent of the patients in this group died a sudden death. This finding is in keeping with other studies. White and Bland found in their series of fatal angina pectoris cases that 82 per cent died from causes attributable to some form of cardiovascular

disease. In a general way it may be said that the prognosis in angina pectoris ultimately depends on whether or not fatal coronary thrombosis develops.

Prognosis. — The difficulties of formulating final statements in regard to the prognosis of angina pectoris are obvious. The prognosis rests upon quantitative diagnosis and analysis. And, viewing the group of cases included in this study in the light of the age at onset and the age at death, the average duration of symptoms and the average life-expectancy, angina pectoris seems a much less grave disorder than is popularly considered. This of course does not minimize the seriousness of angina for the individual. But it does mean that there are sound clinical grounds for a guarded optimism in this disease, and certainly for discarding the prevalent attitude of fear when dealing with this symptom. A study such as this emphasizes the fact that angina pectoris is compatible with many years of useful life. Parkinson has expressed this point of view in an aphorism that is as practical as it is pointed—"Too much attention has been centred on the anginal death, and too little on the anginal life and its management." And ten years ago the late W. S. Thayer, in urging a positive attitude for the physician in guiding a patient with early anginal symptoms into a proper course of life, pointed out in his characteristic way that "if the knife be the most valuable implement of the surgeon, so is the tongue the most precious instrument of the physician".

It is more difficult to appraise the value of factors that may influence prognosis. From this study certain conclusions emerge in this connection. (1) Age is of no practical importance. Obesity affects neither the age at onset nor the duration of the disease. (2) Hypertension may be regarded as a slightly unfavourable factor. (3) Normal electrocardiographic findings have a favourable value. (4) T-wave negativity in the electrocardiogram is an unfavourable sign. (5) The care which the patient takes of his health after the condition becomes established is an important determining factor in prognosis. (6) The amount of exercise which the patient can undertake without inducing anginal pain is some guide to prognosis. (7) Although the hereditary factor was not studied in the present series of cases, it has been fairly well established by other writers that the family background with regard to vascular disease is of importance in estimating the prognosis.

CONCLUSIONS

1. The modern concept and the diagnostic criteria of angina pectoris are discussed.

2. One hundred cases of angina pectoris have been studied. The average age of onset of the disease was 57.3 years. Forty patients died, the average duration of the disease being approximately 3.5 years. In the surviving cases the average duration from the time of the first attack was 4.6 years.

3. The location of the distress in 92 per cent of the cases was substernal or epigastric. The most common mode of radiation of the distress was to both arms.

4. Hypertension was the only physical finding of any significance. It would seem to be a slightly unfavourable factor in prognosis. The incidence of hypertension in women with angina pectoris was much greater than in men, an observation that has diagnostic value.

5. Abnormal electrocardiographic findings were present in 75 per cent of the cases. A normal electrocardiogram carried with it a better prognosis. T-wave negativity was an unfavourable prognostic sign.

6. Fifty per cent of the patients died suddenly.

7. A more optimistic attitude towards angina pectoris would appear to be justified. Factors influencing prognosis are discussed and their value appraised.

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COMPRESSION FRACTURES OF THE VERTEBRAL BODIES FOLLOWING INDUCED AND "IDIOPATHIC" CONVULSIONS*

BY GEORGE E. REED, M.B. AND TRAVIS E. DANCEY, M.D.

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WE were at first favourably impressed by the dramatic recoveries produced by metrazol in schizophrenia, and by the relative safety of the procedure. Neither of these beliefs is now tenable. The recoveries have too often been temporary and the method can no longer be called safe. In August, 1938, we discovered that a patient who had been subjected to two metrazol seizures was suffering from a compression fracture of the body of the fifth dorsal vertebra. This case was reported.[1] At about the same time, Wespi[2] and Stalker[3] separately described the same complication. Polatin *et al.*[4] have since reported that artificially induced epileptiform seizures have produced compression fractures of the vertebral bodies in 43.1 per cent of their cases. A recent clinical and roentgenological survey of our series, including all patients who have had one or more convulsions with either insulin or metrazol gives proof of compression fracture of the bodies of one or more dorsal vertebræ in 31.4 per cent.

Similar fractures have been described following clinical tetanus,[5] also after sneezing when the patient was already in a flexed position.[6] Thus it would seem likely that such injuries might occur in a variety of circumstances where forceful muscular flexion was brought about, and if any one group of individuals would be especially predisposed to this type of trauma it would be the epileptic. The muscular action occurring in a major seizure due to idiopathic epilepsy is essentially the same as that during a metrazol convulsion where we know these fractures do occur. Clinical and roentgenological studies were carried out on 40 women and 32 men, all known epileptics. The ages of the former varied from 24 to 80 years, with an average age of 53.5 while the ages of the latter varied from 19 to 67 years, with an average age of 39.1 years.

Lateral x-ray studies of the dorsal region of the spine demonstrated the presence of compression deformities of the vertebral bodies in 34.2 per cent of cases. The lesions occurred in 46.8 per cent of the men and in 24.5 per cent of the women. A striking resemblance between this group and the metrazol-insulin series is manifest when we note that in the latter subjects these fractures occurred in 50 per cent of the men, and in 18 per cent of the women.

TABLE I.

"IDIOPATHIC" EPILEPSY GROUP

Number examined, 72

Percentage	with compression deformities	34.2
"	men with compression deformities	46.8
"	women with compression deformities ..	24.5

TABLE II.

METRAZOL-INSULIN GROUP

Number examined, 86

Percentage	with fractures	31.4
"	men with fractures	50.0
"	women with fractures	18.0

Discussion.—The fractures and deformities resulting from violent muscular flexion are, to some extent, similar to the better known "external force" fractures inasmuch as they are usually painless at first; seldom produce any evidence of dislocation; damage to the spinal cord is rare; and there is little or no deformity until later. In both types, then, recognition and early diagnosis is entirely dependent upon lateral x-rays of the spine. There are, however, *two outstanding characteristics* of the newly recognized type of injury. First, we note that these fractures involve particularly the vertebral bodies of the mid-thoracic portion of the spine, and, second, we find that usually more than one vertebral body is affected.

A study of the etiological mechanisms of the two types of fracture explains these differences. In the fracture produced by external violence the patient falls upon the buttocks with the stress and weight concentrated at the level of the twelfth thoracic and first two lumbar vertebræ, or the patient may fall upon the head, causing extreme flexion and weight stress to centre upon the lower cervical vertebræ (6th

* From the Verdun Protestant Hospital.

Read before the Psychiatric Section of the Montreal Medico-Chirurgical Society, September 28, 1939.

and 7th) with a compression dislocation occurring there. In these and similar cases, one vertebral body is crushed at once by the single trauma. The epileptic and other severe muscular stresses act quite differently. The muscles ventral to the spine act upon the whole length of the column, usually indirectly, to produce a generalized flexion. Opposing these muscles there are powerful extensors of the spine tending to support and even produce extension of the cervical and lumbar segments. There are very few muscles able to exert any extension of the mid-thoracic section of the spinal column. Hence, any generalized severe muscular action (such as a seizure) produces extension of the cervical and lumbar spine with flexion and *angulation* of the thoracic portion. This can actually be observed in epileptic or metrazol seizures, although their neurological mechanisms differ somewhat. The localized flexion, described above, undoubtedly explains the unusual location of these fractures. The fact that more than one vertebral body is involved is probably explained on the basis of not one, but repeated traumatisms. This latter supposition is borne out, to some extent, by those cases that have had only one seizure, followed by fracture of only one vertebral body. One of our insulin patients developed a typical lesion of this sort after a single convulsion during hypoglycæmia.

Conclusions.—1. In our series of 86 cases, 31.4 per cent showed compression fractures of the thoracic vertebral bodies after metrazol therapy.

2. In our series of 72 adult epileptics similar fracture deformities were seen in 34.2 per cent of cases.

3. From the examination of our cases it appears that "traumatic spondylosis" may yet explain much that has heretofore been obscure, in the pathology of the spinal column.

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THE TREATMENT OF MENTAL ILLNESSES WITH METRAZOL*

(PRELIMINARY REPORT ON SEVENTY-SIX PATIENTS)

BY J. A. CUMMINS, M.D.

Hamilton, Ont.

THE following account is based on our experience at the Ontario Hospital, Hamilton, Ont., with convulsion treatment from September 17, 1938, to March 31, 1939.

Metrazol therapy at this hospital includes the production of epileptiform fits by the intravenous administration of metrazol, occupation, recreation, and psychotherapy. The treatment was thought out and developed by Dr. Ladislaus von Meduna, of Budapest.

In 1929 Nyero[1] and Jablonszky observed that cases of epilepsy in which schizophrenic features were present recovered rapidly when fits were frequent, and in 1930 Muller described two cases in which schizophrenic illnesses were recovered from rapidly after the occurrence of spontaneous epileptic fits. Glaus in 1931 pointed out that the combination of epilepsy and schizophrenia was a rare one, and of 6,000 schizophrenics he found only 8 who had had fits at any time in their life and of these 4 recovered shortly after the fits appeared. Similar observations were made by Steiner and Straus in the years 1929 and 1932. As a result, von Meduna reached a conclusion which he expressed as follows.[2]

"There is a biological antagonism between epilepsy and schizophrenia. If we succeeded in producing epileptic attacks in schizophrenic patients, these attacks would alter the chemical, humoral and hæmatological milieu of the organism in such a way that a possibility of overcoming the illness might be created, because the milieu altered in this way would be unfavourable for schizophrenia."

The next step was to select a safe convulsant drug. In 1934 following a series of experiments in animals von Meduna produced epileptiform seizures in the human subject by means of intramuscular injections of 25 per cent camphor in olive oil. He observed that the tendency to convulsion varied with individual susceptibility, both in animals and in man, rather than with factors such as body weight. His first experiments in man were carried out on advanced, long-standing cases of schizophrenia, and little results were observed, but when the method was applied to cases of recent onset encouraging reactions were obtained. Severe side effects, however, in the form of delirium and prolonged vomiting due to over-doses of camphor were encountered. The great bulk of injections, their painfulness and uncertain effects, led von Meduna to investigate other convulsant agents.

The drug.—Of these, pentamethylentetrazol (cardiazol), synonym, American, metrazol, proved to be most safe and reliable. The drug was synthesized by Prof. K. F. Schmidt, of

* Read before the Hamilton Academy of Medicine, May 3, 1939.

Heidelberg, during experiments on the synthesis of water-soluble substances having the therapeutic properties of camphor. Although no very close similarity exists between the chemical formulæ of camphor and metrazol the latter has the stimulating effects of camphor with the advantages of solubility, ready absorption and elimination, and suitability for intravenous use. Pentamethylentetrazol is a white crystalline powder with a faintly bitter taste. It is soluble without decomposition in most organic solvents and in water, the aqueous solution being almost neutral. After sterilization at 120° C. for half an hour it showed no change after storage for a month. Here, it is our practice to make the solution up fresh each week. It has only mild bactericidal properties. Very sensitive tests are available to detect its presence. The sulphonal and barbitone drugs are antagonistic to its action, and, therefore, are not used as sedatives during metrazol treatment. In large doses it produces convulsions in rabbits and in man. It is a powerful stimulant of the respiratory centre, and it is probable that this is the reason for the rarity of alarming asphyxial symptoms after the apnœic period during the fit. Although there may be considerable cyanosis if the airway is clear no anxiety may be felt. Three of our patients have shown expiratory difficulty following the fit. In the first, treatment was discontinued and in the other two the difficulty was overcome by use of an airway. In all three patients the inability to expire through the nose was suspected to be due to mechanical interference by the uvula and soft palate. Mechanical interference of oral expiration is due to holding the jaws shut and pushing the tongue forcibly forwards. The condition was most pronounced in an edentulous female aged 50.

Metrazol is a powerful stimulant of the vascular system generally, and it has a wide use in small non-convulsive doses for this purpose. In convulsive doses the heart may beat violently with moderate increase in rate, or the pulse may be slow and strong. The drug increases the irritability of the vomiting centre. Nearly all our patients suffer emesis and this is especially prevalent with their first treatments.

Owing to its ready solubility in practically all solvents and in lipoids pentamethylenetetrazol is rapidly absorbed, even if given intramuscularly. The latter administration is unpopular because the patient must be watched up to an hour for the possible occurrence of the convulsion. The final mode of excretion is as yet uncertain. The drug is removed rapidly from the circulation after intravenous injection. It is not excreted unchanged, since none is found in the excreta and only a small amount found unchanged in urine passed immediately after the convulsion. It is, therefore, concluded that the drug is rapidly broken down in the blood stream. Biehler has shown that the destruction of the drug is so rapid that two doses of 1 c.c. of a solution injected shortly after one another do not produce in experimental animals anything like the effect of a 2 c.c. dose. So rapid is the destruction that speedy injections of the drug are essential in convulsive therapy. Also we have found that fewer repeat doses are necessary if the second injection is given within two minutes when the first one has failed. By this method some metrazol from the first injection is still present to act with the second dose.

Himwich, Alexander and Lipetz[3] were led to assume by previous work done that insulin and metrazol therapy for schizophrenia had the presence of a common factor, namely, diminished cerebral metabolism. In hypoglycæmia this factor arises owing to an acute deprivation of glucose and with metrazol because of acute anoxæmia arising from severe convulsions and temporary arrest of respiration. These authors achieved intense anoxæmia in patients who were allowed to inhale nitrogen. Five cases were treated with promising results.

Dean,[4] realizing that the alkaline state is tetanic in itself, and that hydration also favours the occurrence of convulsions, used metrazol in conjunction with a high alkaline ash diet and increased fluid intake. A control group who received regular diet and fluid intake was also treated. Dean concluded that alkalinization and hydration are not only superfluous but undesirable in the course of metrazol therapy.

Denyssen and Watterson[5] gave vasodepressant drugs such as amyl nitrite, sodium nitrite, and histamine, prior to the administration of the known convulsive doses of metrazol. No fits occurred, and the authors suggest that the convulsion is due to sudden vaso-constriction.

Mayer-Gross and Walk[6] have treated patients by the intravenous administration of cychlohexylethyltriazol with encouraging results. Triazol has the advantages of smaller dose, less unpleasant for the patient, and elimination of venous sclerosis.

OUR OBSERVATIONS

At the time of writing metrazol therapy has been completed on 77 patients at this hospital. In order that the results may be determined as accurately as possible the following classification has been used. This classification is the standard used throughout Ontario and in the majority of hospitals on this continent where insulin and metrazol therapy are utilized.

Full remission:

1. No psychotic signs or symptoms detectable on careful clinical examination.
2. Complete insight into the illness. Can discuss it with equanimity.
3. No residual change in personality.
4. Normal affective relationships.
5. Able to live at home and to resume work at previous level of efficiency.

Social remission:

1. No gross or debilitating psychotic signs or symptoms.
2. Partial insight into illness. Realizes there have been symptoms but rationalizes, etc.
3. Slight residual changes in personality.
4. Able to live at home and to work, but previous level of efficiency may be impaired slightly.

Improvement:

1. Psychotic signs and symptoms present but subsiding. More easily managed. Milder.
2. No insight.
3. May be able to live at home under suitable conditions. Fair social adjustment.
4. Able to do simple work.
5. Able to care for fundamental needs without supervision.

No improvement:

Condition remains essentially the same or worse. No improvement in manageability or in extent of psychotic symptoms.

The following tables show the number and types of patients treated and results obtained.

From Table I it is observed that all cases of less than six months' duration responded to the treatment, and that 50 per cent of them made a complete recovery. The results are seen to vary directly with the duration of the illness. Six of the 17 classified as "negative" for statistical purposes have shown marked improvement in their hospital adjustment. They are now friendly, good workers, tidy and co-operative. No change for either worse or better was noted in the remaining 11, although one has been home on probation now for two months.

TABLE I.

SCHIZOPHRENIA—DURATION

Remission	*Less than 6 months*	*6 – 18 months*	*Over 18 months*	*Total*
Full remission..	6 – 50%	3 – 14%	0	9 – 17%
Social remission	4 – 33%	4 – 19%	3 – 16%	11 – 21%
Improvement..	2 – 17%	9 – 43%	4 – 21%	15 – 29%
Total benefited.	12 – 100%	16 – 76%	7 – 33%	35 – 67%
Negative.....	0	5 – 24%	12 – 63%	17 – 33%
Deaths.....	0	0	0	0
Total.....	12	21	19	52

Table II indicates that of all types of schizophrenia, chiefly catatonics, are treated. The catatonic responds much better to metrazol than any of the other types. Paranoid types and schizophrenias of over eighteen months' duration do better with insulin.

Compare these results with statistical studies made prior to the use of metrazol or insulin therapy. Statistical workers[7] found that the rate of spontaneous remissions of schizophrenic patients varies between 4 and 12.5 per cent. Schizophrenic patients are usually hospitalized for a number of years, so that as a rule more than 50 per cent of the populations of mental hospitals is made up of schizophrenic patients. Also, after these so-called "spontaneous remissions" emerge from mental hospitals many are

TABLE II.

SCHIZOPHRENIA—REACTION TYPE

Remission	*Simple*	*Paranoid*	*Catatonic*	*Hebephrenic*	*Other types*	*Total*
Full remission.....	0	0	9	0		9
Social remission.....	1	1	9	0		11
Improvement.....	1	2	12	0		15
Total benefited.....	2 – 50%	3 – 60%	30 – 70%	0		35 – 67%
Negative.....	2	2	13	0		17 – 33%
Deaths.....	0	0	0	0		0
Total.....	4	5	43	0		52

Three of the patients classified as improved have relapsed and are receiving hospital treatment.

not able to pursue their former occupations even though they may be taken care of in their homes. It is to be noted then that the quantity and quality of remissions attained by the convulsive therapy are superior to those of spontaneous remission, and finally the length of hospitalization is markedly abbreviated. The average number of convulsions required for remissions in this group was 13 and the time in hospital necessary for this amount of treatment would be approximately three months.

TABLE III.

MANIC DEPRESSIVE PSYCHOSIS—DURATION

Remission	*Less than 6 months*	*6 – 18 months*	*Over 18 months*	*Total*
Full remission..	3 – 37%	2 – 33%	2 – 66%	7 – 41%
Social remission	2 – 25%	2 – 33%	0	4 – 23%
Improvement..	2 – 25%	2 – 33%	1 – 33%	5 – 30%
Total benefited.	7	6 – 100%	3 – 100%	16 – 94%
Negative.....	1 – 12%	0	0	1 – 6%
Deaths.....	0	0	0	0
Total.....	8	6	3	17

Table III indicates that the response of the manic depressive psychosis to metrazol therapy is much greater than in the schizophrenic psychoses. Further, the duration of the illness is of no significance. The average number of convulsions required for a remission in this group was eight. The average time needed in hospital for administration of the treatment—2 months. The tendency toward spontaneous remission has always been considered very good in manic depressive psychoses. The therapeutic factor then resides mainly in the shortening of the period of confinement. In a survey[7] of 8,000 manic-depressive patients it was found that the average duration of the attacks or episodes was a little over a year.

TABLE IV.

MANIC DEPRESSIVE PSYCHOSIS—REACTION TYPE

Remission	*Manic phase*	*Depressed phase*	*Mixed type*	*Other types*	*Total*
Full remission..	3	4	0		7
Social remission	2	2	0		4
Improvement..	1	4	0		5
Total benefited	6	10	0		16 – 94%
Negative.....	1	0	0		1 – 6%
Deaths.....	0	0	0		0
Total.....	7	10	0		17

Table IV indicates that either phase of the psychosis responds equally well to treatment.

Table V shows that, as in schizophrenia, the duration of the illness is a factor in the response that may be expected from metrazol

TABLE V.

INVOLUTIONAL PSYCHOSIS—DURATION

Remission	*Less than 6 months*	*6 – 18 months*	*Over 18 months*	*Total*
Full remission..	2 – 100%	0	1 – 20%	3 – 43%
Social remission	0	0	2 – 40%	2 – 28%
Improvement..	0	0	1 – 20%	1 – 14%
Total benefited.	2	0	4 – 80%	6 – 86%
Negative.....	0	0	1 – 20%	1 – 14%
Deaths.....	0	0	0	0
Total.....	2	0	5	7

TABLE VI.

INVOLUTIONAL PSYCHOSIS—REACTION TYPE

Remission	*Involutional melancholia*	*Involutional paranoid type*	*Total*
Full remission..	1	1	2
Social remission.	3	0	3
Improvement...	0	1	1
Total benefited.	4	2	6 – 86%
Negative.....	1	0	1 – 14%
Deaths.....	0	0	0
Total.....	5	2	7

therapy. The duration of the involutional psychosis, however, is not nearly so significant as it is in schizophrenia. It was found in treating these cases that those of short duration responded quicky to treatment. Cases of longer duration required more convulsions, tended to social remissions and improvements, and, in one instance, had a negative result. The average number of convulsions required for a remission in this group was thirteen. As in manic depressive psychosis, the average time required for a spontaneous remission is approximately one year. Although the average time is estimated at one year for these psychoses, the axiom "lasts from 6 months to 6 years" must not be forgotten.

One case of psychoneurosis, psychasthenic type, was treated with no improvement. Other hospitals report very good results with treatment of the psychoneuroses.

Treatment has been completed on 77 patients. Of these, 57, or 75 per cent, have benefited. Of

the 57, 45 are on probation. Of the other 12 7 could go on probation if their families were in a position to take them. They are chiefly patients classed as improved, and are, therefore, unable to return to the community on their own responsibility. The remaining 5 constitute the relapses. A further advantage of treatment is an improvement in the general physical condition seen most frequently in patients who, prior to treatment, were debilitated. There has been an average weight gain per patient of eight pounds. The treatment is, therefore, not a debilitating one.

Of the 20 who are classified as showing no improvement 7, or approximately one-third, are making a greatly improved hospital adjustment, and are much happier themselves for having received the treatment. A few of these same seven could be probated if home conditions were suitable. While 5 patients now in hospital are known to have relapsed, 2 in hospital are known to have shown further improvement after metrazol was discontinued. One patient on probation has shown further improvement since his return home. The employer of one of our full remissions in schizophrenia reports that he is now a much better employee than before the onset of the illness. Formerly he was shy and retiring; now he readily assumes responsibility and shows initiative.

Dosage.—The convulsant dose of metrazol is about five times the amount usually used as a cardiac and respiratory stimulant. Animal experimentation has indicated that the lethal dose for the human subject is about 3 grams. One case of cardiazol poisoning is recorded,[8] that of a laboratory assistant, who, with suicidal intent, drank 100 c.c. of a 10 per cent solution and died within an hour. Analysis of body fluids and tissues revealed an amount of cardiazol reckoned to be the equivalent of a dose of 3.2 grams subcutaneously in a man weighing 65 kilograms. Autopsy showed the usual findings of camphor poisoning.

Since the initial convulsant dose is 0.4 or 0.5 grams there appears to be a good margin of safety even when the dose is repeated three times on the same day.

As noted above, a 10 per cent solution of metrazol is used. The drug is administered intravenously into the veins of the arm. The initial dose of 4 c.c. for females and 5 c.c. for males, as recommended by von Meduna, has been found preferable by us.

If an initial dose of 4 c.c. is unsuccessful in producing a convulsion within one minute a second dose of 5 c.c. is administered, and if this second injection also fails a third dose of 6 c.c. is given after one minute has elapsed. When the third dose fails no more is given until the next day, when the first injection would be 7 c.c.

The dose given on successive treatment days is the convulsive dose of the previous day. For example, if 4-5-6 c.c. were given and 6 c.c. produced a convulsion, then 6 c.c. would be the initial injection on the next day. When a convulsion does not occur the dose is increased 1 c.c., and when a convulsion occurs the dose is never increased. In the earlier stages of treatment three repeat doses are given, since the total amount of the three injections is small. Later, when doses are larger, if the total of three doses is going to approach 32 c.c. then only one repeat dose is given.

DIFFICULTIES AND COMPLICATIONS

The most common difficulties are the nausea, vomiting, headache and muscle pain following treatment. These tend to lessen greatly or disappear as treatment progresses. Nausea, vomiting and headache occur in proportion to the number and size of the doses administered on that day. The next most common difficulty is the subconvulsive dose. With it the patient is subject to a period of extreme anxiety which invariably influences his attitude toward future treatments unfavourably. It may be combated to some extent by commencing with a sufficiently large initial dose, speedy injection, and administration of the repeat dose as soon as possible. If, when injecting, some of the dose is seen to be missing the vein then it is advisable to stop and fill up the syringe to the convulsive dose before continuing. Sclerosis of small veins invariably occurs when they are used. In several cases this has eventually caused the cessation of treatment. The possibility of pulmonary embolism arising from them must be borne in mind, although no case is as yet reported. Alarming cyanosis, respiratory difficulty, may, as mentioned above, be successfully dealt with by artificial respiration and the insertion of an airway. Status epilepticus might occur, and for this emergency

sodium luminal and amytal are carried on the treatment tray. One case of idiopathic epilepsy is reported to have developed during treatment.[8] It cleared up spontaneously in the course of a few weeks and the patient obtained a favourable result from the treatment. Dislocation of the jaw has been common. In our experience this occurred once after a subconvulsive dose had been administered. The condition is always reported to occur during the convulsion. Dislocations of the humerus out of the glenoid cavity have often been reported. They may occur early in the confused state or following the convulsion, but they are met with most frequently during the convulsion. Dislocations should be relocated if possible before the patient regains consciousness. Thus undue stretching of the ligaments and possibly later operative procedures are avoided. Dislocations of the hip are infrequent. Thirty-one fractures were reported in the treatment of 1,465 patients. Fractures of the necks of the femurs are as common as any; bilateral fractures of the necks of the femur in one convulsion are as frequent as fracture of one neck. By far our most serious complication to date has been the bilateral fracture of the necks of the femurs. This occurred at the end of the tonic stage of the fourth treatment. One fracture occurred within a few seconds of the other. The accident happened in a case of schizophrenia of eight years' duration. This patient was a very inactive person who spent his day sitting or lying about. Von Meduna observes that these fractures are prone to occur in cases of long duration treated as bed cases and who have undergone a considerable degree of emaciation. There occurs perhaps a relative avitaminosis, reflected in osseous changes. This view is supported by the fact that pellagra, a disease in itself due to avitaminosis, occurs in mental hospitals. It is of interest that our patient was not emaciated but his case was of long duration and he had been very inactive. Further, he suffers with psoriasis which clears up when vitamin C tablets are given him.

Mortality Rate

In February of this year a survey by von Meduna[7] of 4,409 patients treated showed 9 fatalities in at least three cases of which the therapy could not be held directly accountable. Yet, inclusive of these three the mortality stands only at 0.29 per cent.

Progress

Three types of remission have been met with.

1. *Rapid.* — In this type there is generally complete recovery, but not always; an excellent result is obtained with one to five treatments. This type of remission is the rule in manic depressive cases, and in them recovery is usually complete. The length of the manic depressive illness seems to bear little or no relation to the number of treatments required for recovery. A similar response occurs fairly consistently in the involutional psychoses of recent onset. Rapid remissions also frequently occurred in catatonic illnesses of recent onset. In the latter, however, complete remissions are fewer and only partial recovery is often observed.

2. *Progressive remission.*—This is by far the most common type in the schizophrenic cases. It is the rule in cases of more than six months' duration, and it is a common response in illness of very recent onset. It is also the rule in the involutional psychoses of long duration. When remissions are progressive they are also more likely to be partial. Partial remissions are more prone to relapse. Niven *et al.*[11] estimate that 34 per cent of social remissions relapse. Our relapse rate is much less than 34 per cent.

3. *Intermittent remissions.*—Intermittent progress is uncommon in metrazol shock therapy unless the reactivation of mental symptoms seen on the day of treatment and the day following treatment are considered. Improvement resulting from a treatment is usually not observed until the second day after the treatment. Therefore, treatments given bi-weekly allow time for this improvement to show itself before the next injection is given. On the day of treatment and on the day after the mental status is often similar in content if not in degree to what it was before treatment was commenced. This is known as reactivation of the psychosis. In cases that respond to treatment this gradually shortens in duration, to include only the day of treatment, and eventually it disappears altogether. It is a good guide as to when treatment may be discontinued. We do not terminate treatment while reactivation of the psychosis is present. This reactivation of psychosis was very well illustrated in a case of psychoneurosis, neurasthenic type. The case was treated following the series reported in this article. The symptoms included weakness, uneasiness, worry, dizziness, and palpitation of

the heart, associated with great fear of death. Following the fifth treatment the reactivation of the fear of death was so vivid that the patient could not be persuaded to continue his treatment. Conversely, in a few instances we have observed a lucid interval of about 2 hours immediately following treatment. After the two hours passed these patients lapsed back to their former mental status. Later on in their course of treatment they showed the reactivation of psychosis described above. We have observed this phenomenon in all types of cases treated. In the early stages of treatment psychotic conduct may be even more marked than before treatment is commenced. Thus we have observed catatonics to become even more mute, seclusive and resistive and involutional psychotics to be extremely agitated, depressed and self-accusatory; manics more maniacal and the depressed more depressed. This reactivation is nearly always an indication that a favourable response to treatment can be expected.

We have also observed that patients tend to pass through several or all phases of their psychotic disorder during treatment. A case of catatonic stupor may develop excitement. When the excitement disappears confusion, blocking, paranoid ideas and hallucinations are observed. In this set of symptoms the blocking, confusion, hallucinations and delusions, tend to disappear in that order. Euphoria is often observed towards the end of recovery. Tenseness, restlessness and uneasiness, usually the first symptoms of a catatonic illness, are generally the last to go. In some apparently full remissions this tenseness in some degree has seemed to persist. It has been explained by the patient as his normal state. One of these relapsed. As full remission comes on the patient becomes friendly, and when full remission has occurred he is impressively alert, interested and spontaneous. One is continually astounded by the delightful personalities that emerge almost overnight in the terminal stages of treatment. This constitutes the most attractive and satisfying feature of the work. During the course of their recovery some pass through phases which might take months or years if they occurred at the usual speed of development of a schizophrenic illness. This tendency to go through the various phases of an illness while recovering is also present in the involutional and manic depressive psychoses. In the latter it is not so readily observed because remissions are often rapid and also because there are fewer phases in these illnesses.

PSYCHOTHERAPY

To achieve this aspect of therapy the already organized departments of the hospital have been enrolled. Occupational, recreational and re-educational facilities are made available for the patient during his awake hours, and a constant effort is made to keep him interested in his environment to the limit of his capacity. To accomplish this one full-time nurse is assigned to female patients receiving metrazol therapy and one full-time attendant to male patients. Relief and additional staff are also assigned to help in these duties at times during the day.

The goals of psychotherapy are:—

1. To establish in the patient's mind that he has had a "mental" illness.

2. To reveal its causes and how it developed.

3. To explain why the hallucinatory experiences and delusional ideas were of the nature that they were. This often is not difficult, and yet it is important because it makes the patient realize that his psychotic experiences have arisen within himself and not from the outside world, as he is bound to believe if he is not helped with psychotherapy.

4. To discuss the milieu of the patient, his habits, attitudes and other aspects of his personality.

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ROUTINE HEARING TESTS*

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GREAT changes in the tests for hearing have been developed in the last fifteen years, and many of these are unappreciated as yet by the medical schools and the medical profession.

Previously, the student of otology had to gain his knowledge from a physiology that was theoretical and a pathology that was limited almost entirely to the study of gross specimens. Since 1923, however, the development of new instruments of precision and new physiological methods applicable to otology has stimulated a vast amount of research. Already this has exposed the fallaciousness of many statements and tests found in the current otological textbooks.

It is the purpose of this paper to indicate why and in what manner the old order has changed. It provides the necessary references but it here acknowledges its particular debt to the papers from the Otological Research Laboratory of the Johns Hopkins University.

Hearing tests are intended to provide a statement or estimate of a patient's hearing at a certain time under certain conditions. Often the patient, the patient's counsel, or the judge asks what percentage of normal hearing the patient has. When such an estimate has been stated the next question asked is usually "How do you know?" To this, the examiner is apt to reply "I have performed all the usual routine tests".

In accepting these two statements the enquirer assumes: (1) that there are universally accepted routine hearing tests; (2) that such tests are reliable; (3) that when they have been properly performed it is possible to say that a patient has a certain percentage of useful hearing; and (4) that the examiner can perform these tests. Authority for these assumptions is searched for in the latest editions of representative texts.[1, 2, 3, 10, 28, 29, 30, 31]

The tests of hearing mentioned in these texts are those by the conversational voice, the whispered voice, the watch, the Politzer acoumeter, several whistles, the monochord and tuning-forks (Weber, Rinne, Schwabach and Gelle). These may, therefore, lay claim to being the hitherto universally accepted routine hearing tests.

Study of the various authorities referred to shows that the authors successively make less and less claim to the value of the tests. Sometimes no statement is made regarding the significance of a test or the significance of a group of tests taken as a whole. Some of the authors reiterate the tests enumerated by Politzer but direct little or no attention to the defects of these tests which Politzer clearly stated. Patients are not interested in the manner in which they hear whistles and tuning-forks, but they are vitally interested in their ability to hear conversation. The ability to hear speech varies with the word spoken and the voice of the speaker. Some words are understood at a disproportionately greater distance than others. The reason for this is that the power for comprehending different words at a fixed distance depends on the manner in which the vowels and consonants are combined and also on the rhythm and accentuation of the syllables.[2]

Were this all that testing of speech depended upon it would be possible to construct a group of sentences with which deaf patients could be tested at various distances in a standardized hall, although no one knows at what distance a "normal" person should hear either whispered or conversational voice. (It is important to note that the provision of such a standardized hall would be something that very few institutions or otologists could afford.)

This is not the only factor. The main one is the voice of the speaker. The difference in the volume and timbre of the voice in different individuals and at different times, both for ordinary conversation and whispered speech, influences the precision of testing the hearing for speech.[2] Some physicians maintain that they can test the hearing of a patient for conversational voice and for whisper and do so in such a manner that their results will be strictly

* A paper read at the Seventieth Annual Meeting of the Canadian Medical Association, Montreal, June 21, 1939.

comparable with a result obtained at a previous or a subsequent examination by themselves. Otologists are still advised by authority to train themselves so that their spoken words should always be heard at approximately the same distance,[1, 12] Unfortunately, this idea is unsound. Politzer as long ago as 1909 advanced proof that it is impossible to always speak with the same strength of voice even with the most careful practice. The results of testing the hearing for conversational and whispered voice are, therefore, not of absolute but only of relative value.[2, 3] The watch and acoumeter and whistle tests are obsolete.[2] Monochord bone conduction tests are particularly misleading.[27] The only use of the monochord is to demonstrate the ability of the ear to hear high tones. They are either "heard" or "not heard". No quantitative value can be given to the record obtained since the intensity threshold of acuity for the tones of the monochord can be obtained only by a method of distance measurement either out of doors or in a very large hall.[4]

It is unnecessary to enumerate the various tests by tuning-forks. Three of them are in common use today, even though Politzer pointed out their imperfections in 1909. There is now histo-pathological proof of the inaccuracy of one of them (the Weber test).[5] Even when performed by a careful examiner the results obtained vary with the psychological state of examiner and patient. A committee of the Royal Society of Medicine[1] recently recommended these tests in spite of the fact that the same body devoted several years to exposing their fallacies.[6]

The British committee recommended the use of tuning-forks of certain physical qualities. The author procured a set of these tuning-forks and has found them and the committee's method for using them impractical for hospital use and for office practice. They have a long period of vibration and are very heavy. Fatigue or temporary inattention on the part of either the patient or the examiner produces results which the examiner finds uncertain and unsatisfactory. The inaccuracy which I still feel occurs with these tests in spite of their being carried on in unusually advantageous conditions,—in an almost sound-proof room, in the same spot in that room, with properly certified tuning-forks and with conscientious attempts to stimulate the tuning-fork the same way each time,—has led me to mistrust my own figures and to mistrust the figures of other otologists unless I know that the conditions under which their tests are produced are as advantageous as mine. The above conditions required to enable the tests of one otologist to be comparable with those of another are so difficult to provide that I do not believe that tests according to the British method will find more than a few advocates. Under the conditions unavoidably met with in every day practice tuning-fork tests are so inaccurate as to be of limited value as quantitative tests of deafness. The value of the tuning-fork in the testing of hearing by air-conduction has long been under suspicion but it is only recently that its fallacies in the testing of bone-conduction have been fully revealed.

It has been proved useless to estimate bone-conduction by a tuning-fork of less than 256 d.v. because for lower tuning-forks the patient has difficulty in estimating the end-point; he has difficulty in appreciating when he stops hearing the tone as distinct from the vibration of the fork. A tuning-fork of 512 is to be recommended. The use of the tuning-fork is further fallacious because the length of time that it is heard depends upon the strength and the position of the fingers grasping its stem, on the pressure with which it is pressed against the bone, and on the particular area of bone over which it is placed. Wide variations in bone-conduction in supposedly normal persons show the fallacy of labelling bone-conduction as abnormal when a determination on a patient is compared to a measurement on a single "normal" individual.[7] Crowe[8] makes a point of saying that tuning-fork tests are necessary supplements to audiometer tests. Yet in many of his case reports he does not publish the tuning-fork tests accompanying the various histo-pathological lesions described. In other words he does not support his own contention.

Even after much description and discussion of the tests the textbooks say little as to the kinds of diagnoses that can be made from the tests. The report of the British Committee is interspersed with notes on the "clinical significance" of the various tests, but no histo-pathological evidence is given anywhere to prove such clinical significance. It is of little value to make hearing tests with tuning-forks or otherwise, unless they can be intelligently interpreted.[9]

The four assumptions mentioned earlier have been found assumptions and not facts. It is right, therefore, to conclude that although there have been "routine hearing tests" they are, when all is said and done, relatively fallacious and nearly valueless.

The reason why there has been stubborn loyalty to unsatisfactory apparatus and modes of testing hearing for so long is because it is only recently that other methods and other apparatus have been available to otologists, and it is only still more recently that enough evidence has gathered to show how these must be used and how some of the results may be interpreted. The latest textbooks omit the great mass of the former routine hearing tests and devote a percentage of their space on hearing testing to the use of audiometers. These new electrical instruments attempt to supply sounds of known intensity for the purpose of testing hearing. There are two types: The pure-tone audiometer and the gramophone audiometer (which I will refer to in what follows as the "2A-type" and the "4A-type" respectively). They provide help of a kind denied to otologists prior to 1921.

The 2A-type audiometer provides a test of the hearing for pure tones (as the tuning-forks were supposed to do) but with the following advantages.[11]

1. Each tone can be maintained at each intensity level and raised or lowered at will until the threshold of the patient for that tone is definitely established.
2. Any given intensity for any tone can be duplicated with ease and certainty at a later time or at another location.
3. Tones of higher pitch can be produced than with the tuning-fork, and the intensity threshold can be determined with each high tone.

Because of the unwillingness of patients (and of some examiners!) to admit that pure tones are an adequate test for deafness an attempt has been made to supply an audiometer which will test hearing for the voice. The 4A-type of audiometer is the best that has so far been devised. It is by no means ideal. By it a patient listens to speech, of a sort, as transmitted from a gramophone record by a telephone receiver.

The testing of hearing is still far from perfect. I have found, times without number, patients whose ability to hear the 4A-type audiometer is markedly impaired, who respond relatively much better to the pure tones of the 2A-type. I have found many cases of exactly the reverse type. This experience is one that many other otologists have encountered, not only with audiometer tests but also with tuning-fork tests. The unavoidable conclusion is that neither the 2A-type of audiometer nor tuning-forks give an accurate estimate of a patient's "useful" hearing. However, in spite of their expense, cumbersomeness, and upkeep audiometers have become essential to the modern otologist. The manufacturers provide instruction booklets, but it is surprising how the purchasers of machines will fail to follow even the simplest instructions. Every otologist who submits an audiogram to the court as a record of his patient's hearing should, among other things, be made to prove that his machine was in first-class condition at the time the test was made.

Hearing tests will not be comparable unless the room in which the tests are made can afford identical conditions for subsequent tests. The more sound-proof the room is the more it approaches this requisite. Such a room is not a luxury, it is a necessity for anyone who is certifying to a patient's state of hearing or investigating a patient for the purpose of discovering the result of treatment or time.

It is also essential that the examiner should use "masking" when testing the hearing for air-conduction and also for bone-conduction. He must be familiar with the technique and the indications for "masking". There are various devices for this purpose. One device provides a light telephone-receiver which can be fastened over one ear and a dial so that the intensity of the masking noise can be varied as required and a record made of the intensity of masking used. The Barany noise apparatus is inefficient and quite unsatisfactory; it cannot be standardized;[12] it has to be frequently rewound and has to be held in the patient's ear; finally, it does not shut out the loud voice or high tones. The use of a masker is imperative if the difference between the hearing of the two ears is 25 decibels or more. Only by the use of a masker at a proper intensity can the examiner prevent interference from the noises in the testing room, and, further, by using it at a high enough intensity prevent the testing sound from being perceived in the ear not being tested. It is true that masking may distract some patients but it has been proved[12] that a masking tone can usually be introduced into one ear without interfering with the hearing in the other ear. Some audiometers provide a device for testing bone-conduction and

so important is this part of the test that it is necessary here to point out some of the frequently quoted statements regarding bone-conduction which modern research has proved incorrect and also some new discoveries regarding it.

Otologists have long been aware of two supposed anomalies connected with the testing of hearing by bone-conduction. The first of these is the old but at first sight paradoxical observation that certain patients have normal hearing by air-conduction but impaired by bone-conduction. An important pathway by which the sound waves reach the inner ear consists of the osseous trabeculæ that connect the medial part of the posterior wall of the external auditory canal to the infero-lateral aspect of the horizontal semicircular canal. Guild[13] showed evidence that fractures of this important pathway may cause an impairment of hearing by bone-conduction. The other anomaly is the ancient statement that in certain obstructive types of deafness bone-conduction can be longer than normal. Painstaking observations in sound-proof rooms have shown that this statement is incorrect. It has been demonstrated that cases of stapes fixation which show increased bone-conduction under the usual conditions do not show such increased bone-conduction when tested in a sound-proof room.

The popular belief (paracusis Willisii) that in certain deaf people the hearing is better in a noise is now known to be a delusion. Shambaugh, in a memorable demonstration, showed that the symptom of paracusis is not the result of an increase in hearing in the deafened person. The explanation of the phenomenon that certain deaf people can carry on a conversation with a normal person in a noisy place much better than when talking with the same normal person in a quiet place is that in the noise the deaf individual is not bothered by the noise and does not raise his voice while the normal individual is annoyed by the noise and tries to speak above the level of the noise.[14]

The best present methods of testing bone-conduction are imperfect. In spite of these imperfections the test for bone-conduction remains of great importance, for on the proper interpretation of it depends the ability to distinguish between conduction deafness and nerve deafness.

If the essential sensory organ and its nerve supply are greatly impaired or destroyed, there is no hope of improving a patient's hearing. No knowledge exists of how to stimulate the recovery of a degenerated organ of Corti or its nerve supply, nor is there any other nervous pathway which can be utilized for true hearing. But there is hope of improvement if the sense organ and the nerve supply retain their function, hope that some way may be found of overcoming the defect in sound transmission and thus permitting external sounds to reach the sensory organ and give rise to useful hearing. Up to now impairment of hearing by bone-conduction has been universally interpreted as evidence of "nerve deafness". But recently it has been shown that the diminution of bone-conduction may in some cases cause an erroneous conclusion.[22, 23] The impairment, therefore, shoud be very great and supported by other evidence (such as impaired or absent caloric-response) before a "hopeless" diagnosis should be given.

It must not be thought that audiometry is an infallible method of testing hearing. There are several types of audiometer and they are not standardized. An audiometer is an electrical means of generating sound and has the limitations of any machine. To afford reliable information it must have been of good construction; it must be kept in perfect condition; it must be properly used, in proper and constant surroundings; the examiner using it must have avoided methods of using the machines which time has discovered sources of error;[15] and it must, when indicated, have been used in conjunction with a "masker". The use of the 2A-type of audiometer gives the type of information previously provided by tuning-forks with three added virtues; it can produce purer tones at intensities that can be measured and reproduced; it is a great time saver; it affords a test of the entire range of hearing without fatiguing the patient. The 4A-type audiometer affords the test that at present most closely approximates ability to hear the human voice.

It must not be thought that tests by the audiometer are fool-proof. Far from it. Apparently some physicians have welcomed the invention of these machines, thinking that it allows them the liberty of having their hearing tests done by a nurse or a junior assistant. But there are many possible sources of error in the use of the machine, and in spite of the time involved audiometer tests should be performed by the surgeon himself. When evidence regarding hearing tests is being provided a statement should always be

made as to whom the particular hearing test was done by.

It must be remembered further that the 2A-type audiometer provides a record of the threshold of hearing for eight pure tones, *i.e.*, a record of the lowest intensity of each of eight tones which can be heard by the patient, and it provides it in such a way that records can be made subsequently for comparison. It must not be thought that the audiometer card, or audiogram, is a record of a patient's hearing. It is a graphic way of presenting the difference between the normal threshold and the impaired threshold. When several such tests are performed within a short interval of time (the shorter, the better) from the records produced several deductions are possible. If the records show close similarity in curve and variations not over ten decibels one may conclude that the patient is co-operating, is endeavouring to respond truthfully, and that the record is a close approximation to his threshold of hearing for the eight tones of the 2A audiometer. But when such records show dissimilar curves and variations of, say, 25 decibels for various tones it may be concluded either that the patient's mentality is confused or that he is wilfully not co-operating, is malingering, and that, therefore, the record does not represent the patient's threshold for hearing of the eight tones of the machine. The malingerer has no method of simulating partial deafness if he is subjected to testing with the 2A-type audiometer; he is compelled to simulate complete mon-aural or bin-aural deafness. A series of 2A audiometer records have, rightly, considerable value as evidence of the credibility of the patient.

Provided with certain of the audiogram charts is a mathematical formula. This is conveniently used by the examiner to estimate the percentage of hearing of his patient. It rarely occurs to patient or to examiner that this percentage is what they think it is. The percentage as estimated for all 2A-type audiometers is merely the percentage as applied to these auditions of threshold sounds. And nobody is interested in threshold sounds. What the patient is interested in is not what is his percentage of hearing for threshold sounds but what is his percentage of hearing for ordinary conversation. This is information which the 2A-type audiometer at present does not give. These records are of value, on the other hand, to the otologist as an aid toward diagnosis of a deafened person's lesion and at a later date when compared with later similar records as a means of telling the progress of the disease causing the deafness.

This paper has told the average general practitioner that certain beliefs regarding the testing of hearing are no longer valid and provided references for his enlightenment. Having been destructive to a degree it is right to interject a few paragraphs to indicate that new knowledge is accumulating which will improve the differential diagnosis of deafness.

Through the study of the huge mass of material accumulating in Baltimore a certain amount of correlation can be made between hearing tests and histo-pathological findings. The variations from the normal histological picture of all parts of the hearing apparatus have been divided into two groups. In the first group are given pathological defects which may be present without any impairment of hearing. (*a*) *Ear drum changes.*—Slight thickening of the drum,[5] marked calcification in the drum,[5] an extreme degree of retraction of the drum,[5] adhesion of the drum to the promontory,[5] perforation of the drum,[17] almost complete absence of the drum.[17] (*b*) *Middle ear changes.*—Adhesion of the drum to the promontory,[5] bands of embryonic or fibrous tissue in the niche of the round window and the fossa of the oval window,[5] fibrous tissue filling part of the middle ear but leaving certain parts free, notably the epitympanic recess, the anterior superior part and the hypotympanic region.[5] (*c*) *Internal ear changes.*—"Otosclerotic" areas which have not involved the annular (stapedial) ligament, dehiscence in the bony septum between the middle and apical turns of the cochlea,[18] arrested development in the bony apex of the modiolus, abnormal shortening or lengthening of the cochlear canal.[18]

The *second* group shows that the following pathological conditions invariably are accompanied by defective hearing and, therefore, probably do impair hearing. (*a*) *Ear drum changes.*—Extreme thickening of the tympanic membrane due to chronic otitis externa.[19] (*b*) *Middle ear changes.*—Lesions involving the ossicles; adhesions to one another or to the adjacent walls; any pathological alteration in the antero-superior part of the middle ear, from slight thickening of the mucous membranes to the filling of the entire space with fibrous or cystic tissue or new bone;[19] abnormalities of the annular (stapedial ligament), granulations in some parts of the middle ear, necrosis of the

ossicles. (c) Otosclerotic lesions which have invaded any part of the annular (stapedial) ligament. (*d*) *Internal ear changes.*—Atrophy of nerve or ganglion cells in the cochlear nerve from its entry into the modiolus to its terminations in the organ of Corti; atrophy of the organ of Corti.

It is necessary to be very cautious in any attempt to correlate defective function with structural variations. The range of variations compatible with normal function must be known.[11] Already from the study of large amounts of material some of the pathological conditions of the second group have been correlated with certain types of hearing defect. An inability to hear the frequencies near and above 4096 d.v. at high intensities when low tones are well heard usually indicates an extensive lesion of the organ of Corti in the basal coil of the cochlea. When the Eustachian tube and the middle ear are clinically normal and the A.C. audiogram shows good hearing for low tones but an impairment which begins at 256 or 512 d.v. and increases gradually with each octave towards the high end of the scale the lesion may be an atrophy of the cochlear nerve supplying the basal turn of the cochlea. The organ of Corti may not be affected.[8] When the Eustachian tube and the middle ear are clinically normal and the A.C. and B.C. audiograms show an abrupt or sharply localized impairment for high tones, then both the nerve and the organ of Corti in the basal coil are atrophic.

With each decade of life the hearing for the high frequencies becomes on the average more and more impaired.

In disagreement with Wittmaack, Ruye, Manasse, Panse, Siebenmann and Bunch,[25] the Baltimore school has not yet observed any cases with total atrophy of the organ of Corti in which any hearing function was known with certainty to have been present after the atrophy had occurred.

One of the beliefs regarding deafness which has found more or less acceptance is that whenever there is a visible middle-ear lesion and the hearing for high tones is markedly impaired, and especially when there is more loss for the high tones than for the low tones, the diagnosis is "combined deafness". Crowe and Guild[21] have now shown conclusively that while such a diagnosis may be correct it is not invariably correct and that this clinical picture can be produced by middle-ear lesions alone. This conclusion was based on the fact that in several cases with this clinical diagnosis the inner ear was histologically normal; the only lesions seen in the serial sections of the temporal bone were in the middle ear. However, the authors have published a series of cases in which the clinical picture and hearing tests were as stated above, and yet following certain treatment the hearing improved markedly. Two diagrams of Fig. 1 of their paper show the improvement in hearing that occurred in a fourteen-year old boy during the six months after treatment to the lymphoid tissue occluding the pharyngeal orifice of the Eustachian tubes. No other treatment was given during that time.

It is to be noted that the combination of history and hearing test, if considered alone, may point either to the classical diagnosis of combined deafness or the up-to-date one of middle-ear lesion only. The important point must not be overlooked that the differential diagnosis in these cases depends primarily on direct inspection of the Eustachian tube orifice with the nasopharyngoscope.

In the literature are found terms such as "arteriosclerotic deafness", "syphilitic deafness", "hypertensive deafness", "cardiovascular-renal deafness", and "malignant deafness". The medical practitioner naturally assumes that the five most common systemic diseases cause certain types of deafness. It has, however, been shown that no one of these diseases is the cause of impaired hearing for high tones in advancing age.[17] There is no histo-pathological evidence that "toxic-neuritis deafness" occurs.[9] The use of the above terms should, therefore, be discontinued, at least temporarily.

As time goes on more and more correlated histo-pathological abnormalities and hearing defects will be discovered. When this has been done it will then be possible to work in the reverse direction and postulate that a certain type of hearing test will suggest a certain histo-pathological picture.

The most up-to-date information regarding the differential diagnosis of deafness and the prevention of deafness has been ably presented by Crowe in his last two papers.[8, 22] From them the inference may be drawn that much is still to be learned regarding diagnosis by audiometry. There is considerable hope, however, that Fowler's binaural loudness test (1936),[26] as yet not generally known, may prove the means by which the modern mechanical methods of testing

hearing may do what the older routine methods thought they could do but could not.

In conclusion an outline will be given as to how to do an up-to-date routine hearing test. It is recommended that the work be performed rapidly so as to avoid fatigue in examiner and patient.

The first observation should have to do with the mentality of the patient being tested—alert, intelligent, co-operative or slow, uncertain, cautious, illiterate or unco-operative? Next, the examiner should listen carefully to the deaf person's voice in order to understand to what degree the hearing of the patient for his own voice has been changed. With chronic middle ear or other pure conduction deafness a patient's own voice sounds very loud to him, and he has a tendency to speak very low. When there is marked involvement of the perception apparatus the bone-conduction is very materially diminished and the patient's own voice sounds very weak to him; so in order to make others understand him he is likely to speak very loudly.[16] Young otosclerotics have good modulation; older otosclerotics do not modulate but speak loudly.

The patient's hearing for conversational voice and for whispered voice should be recorded. The examiner should be careful to speak or whisper the words with the residual air only and, secondly, and this is most important, no part whatever of his speech or whisper should be accentuated. This is not all. The examiner should state the exact place, time of day, and conditions under which the test is recorded; a description of the room and its measurements should be given; and the examiner should take care to approach the patient from beyond the latter's range of hearing. In spite of these precautions the recorded results must be considered *only approximately reliable* and not comparable with the examiner's own tests at a later date and still less comparable with those of another examiner.

Following this a 4A audiometer test should be recorded, and then a 2A test for air-conduction and bone-conduction. These tests should be performed in a room as sound-proof as possible, and a statement made as to whether or not masking was used and, if it was, at what intensity. Record should be made as to the particular telephone receiver used and whether it was held tightly against the ear tested or whether it was kept away from contact with the ear with a soft rubber shield.

If the examiner possesses a 512 fork, whose performance he thinks he has learned to rely on, he may use it to make an estimate of the absolute length of air and bone-conduction for each ear, but a masker must be used while so testing. Finally, the name of the actual examiner should be given.

Such a record should be repeated at least three times, with an interval of a few days between tests, and in addition an examination should be made of the patient's ears and Eustachian tubes. All this is essential before there are sufficient data on which to attempt a conclusion regarding a patient's deafness.

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MATERNAL MORTALITY FROM THE VIEWPOINT OF THE OBSTETRICIAN*

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IF an obstetrician were looking for the first time at maternal mortality in Ontario he would be amazed to see that the mortality rate has not been reduced substantially in the past thirty years, that childbearing is at present the second greatest cause of death among women of childbearing age, that for less than every two hundred babies born alive one mother dies, and he would not need to look very far to see that many of these deaths are preventable.

It is with these preventable deaths that the obstetrician should be most concerned. Due to uncontrollable factors some maternal mortality is inevitable. But there are controllable factors which, if applied, would reduce the present high rate, and in my opinion there are three which are most important and not unreasonable. Every pregnant woman should have, first, adequate ante-natal care, secondly, a competent obstetrician, and, thirdly, the facilities of a good hospital.

Puerperal sepsis has long been regarded as the chief cause of maternal deaths but in the past few years has taken second place. This would seem to show that deaths due to puerperal sepsis are lessening. Once sepsis develops, the percentage of cases that terminate fatally is great. Sepsis is of course due to the invasion of tissues by micro-organisms, but there are many predisposing causes. The interior of the uterus is most suitable for the growth of organisms. The disorders of pregnancy with such complications as the toxæmias and hæmorrhage are predisposing factors, as is the labour itself with the attendant bleeding, trauma, exhaustion, and in some cases shock. The aim in the prevention of sepsis is to preclude the access of organisms to the patient and to reduce the contributing causes to the minimum. Everything used in connection with the confinement must be aseptic, and the doctor should be conscientious in his personal preparation. While the patient may harbour the infecting organisms, the most common source of infection seems to be the secretion from the nose and throat of some attendant. Thus it is reasonable that all who attend a patient during delivery and early puerperium should wear masks. Any one with a cold or sore throat, or a lesion such as a boil or an infected hang-nail must be excluded from the presence of an obstetric patient. Marital relationship should be discontinued for some time prior to and following delivery, as this is undoubtedly a source of infection. It is advisable that there should be some routine preparation of the patient for the delivery. There is available a halogen derivative of xylenol, which, Colebrook claims, renders the vulva immune to droplet infection by streptococci for several hours. The routine use of ergot post partum may be recommended also. Should a patient develop an infection or be admitted with an infection she must be kept separate from clean patients. All good hospitals have a separate section reserved apart for such cases, and nurses who come in contact with such patients must not attend clean patients. Perhaps the lessening in the death rate from sepsis is due to some extent to the use of sulfanilamide. This in many cases acts in a miraculous manner.

The toxæmias of pregnancy have been since 1935 the chief cause of maternal deaths in Ontario. This is most deplorable, and surely there is something wrong when a condition which in the majority of cases should be controllable constitutes the chief cause of the deaths of mothers. The routine care that is given to the woman throughout pregnancy has as one of its main purposes the detection of a toxæmia. By frequent routine examination of the weight, blood pressure, and urine, the onset of a toxæmia should be detected in time to treat it successfully, much more frequently than is done at present. If a patient shows evidence of a toxæmia she should be watched carefully; if necessary she should be seen twice a day or oftener. If possible a diagnosis of the type of the toxæmia should be made. The minor types usually respond to treatment, or at least do not become dangerous if treated. Pre-eclampsia and eclampsia are serious and

* Read at the Fifty-ninth Annual Meeting of the Ontario Medical Association, Hamilton, 1939.

demand the full regard of the obstetrician. Treatment should be commenced at the earliest opportunity, as many cases of pre-eclampsia may be controlled if treated at the onset. Even though the pre-eclamptic condition does not respond sufficiently to allow continuation of the pregnancy, at least the occurrence of eclampsia should be prevented. Pre-eclampsia and eclampsia may be regarded as essentially the same condition, except that eclampsia may be considered the final condition and is usually characterized by the occurrence of convulsions and one might add, by a mortality of about 20 per cent. If despite treatment a pre-eclamptic condition becomes worse, termination of the pregnancy must be considered. Evacuation of the contents of the uterus at a proper time will prevent eclampsia.

When and by what means to terminate pregnancy in pre-eclampsia is one of the difficult problems in obstetric practice. The tendency is to wait as long as possible, hoping to carry the woman along until such time as the fetus would be viable, but if the delay be too long then both mother and baby may be lost. This is a problem requiring experience and judgment on the part of the obstetrician, and it would be impossible to make any rigid rule regarding it, as each patient is an individual case. As a general rule the delay may be longer in those who have developed the toxæmia gradually than in those who have developed the condition rapidly. The diastolic blood pressure may also be a guide in the prognosis. The method of interference will depend upon the preference and experience of the operator as well as upon certain other factors. The operator will consider the parity of the patient, whether the cervix is soft and dilated or firm and unyielding, the length of gestation, the measurements of the pelvis whether good or doubtful, the presence of any other complication and the condition of the patient. Cæsarean section has contributed to the death rate when performed upon eclamptic patients. While it may be considered in cases of pre-eclampsia after convulsions have occurred the results are not good.

Abortion is the third greatest cause of maternal deaths. It is a common condition and as such is regarded much too lightly. Some are spontaneous, many are induced, either by the patient or by an abortionist. While any may become infected, it is the induced case that causes the doctor the most concern, as post-abortal sepsis is the great factor in causing these deaths. At the first visit of the patient during the pregnancy the doctor should take a careful history and make a complete physical examination. This is especially important in those patients who have aborted previously. Often some condition may be found which is responsible and which may be treated successfully. For example, previous abortion may have been due to thyroid deficiency and in such thyroid extract may be all the treatment required. In some cases of threatened abortion, even after severe bleeding and uterine contractions, either the gonadotropic extract from pregnancy urine or progesterone may be successful in preventing it. The management of incomplete abortion will depend to a great extent upon whether the patient is clean or infected. While many operators explore the cavity of the uterus in clean cases if the case be infected intrauterine manipulation should be reduced to the minimum.

The fourth greatest cause of maternal deaths is hæmorrhage, and the chief conditions are placenta prævia, premature separation of the placenta, and post-partum hæmorrhage. Placenta prævia and accidental hæmorrhage may occur, no matter how careful the pre-natal supervision has been. However, Munro Kerr, quoting from the returns of five large hospitals in Great Britain, reported that the death rate from these two conditions among women who did not receive ante-natal care was four times that which occurred among women who did receive ante-natal care.

Usually the initial bleeding in placenta prævia is not severe but is sufficient to give warning of the condition. It is not nearly as serious as the terrific hæmorrhage that may occur later, which is often precipitated by vaginal examination. If at all possible these patients should be in hospital. Everything to be used in the delivery of the patient should be set up, ready for use, before a vaginal examination of the patient is made. Many require blood transfusions; without such they would die before treatment could be of any avail. The prognosis will be favourable if the patient be treated early, in hospital, by a competent doctor. Previous attempts at delivery in the home, especially if the patient has been packed,

definitely increase the chance of infection. The doctor should attempt delivery in the safest manner possible, which will depend upon the type of prævia mainly, but to some extent also upon the condition of the patient. He should not attempt to rush the delivery but should try first to get the patient into a condition sufficiently good to endure it. In cases of complete placenta prævia and in the more severe types of the partial, especially in primiparæ, the most conservative form of treatment is Cæsarean section, provided the case is clean and the operator competent. As the severity of the type lessens so will the management vary, until such types as the slight marginal may require only rupture of the membranes to allow the head to engage, come down, and labour to proceed normally.

The condition of the uterus should be noted immediately after and for some time following every delivery, particularly when there has been evidence of uterine inertia or undue stretching of the uterus as by multiple pregnancy or hydramnios. A patient should not be removed from the delivery room until the uterus has contracted firmly. Almost any postpartum hæmorrhage may be stopped temporarily by pressing the uterus between the hands, one placed on the fundus, the other just above the level of the cervix. Often however, there may be a steady trickle of blood, which, while not alarming at the time, if allowed to continue will exsanguinate the patient. In such cases it is wise to pack the uterus firmly, preferably with iodoform gauze, and if done in an aseptic manner will cause no trouble but will allow the doctor an easy mind.

Embolism and sudden death and other accidents of pregnancy and childbirth contribute well to the total number of deaths. Embolism is one of the true accidents. Yet it might occur less frequently if the patient were in the best condition before delivery, if during delivery the amount of trauma and blood loss were reduced to the minimum, and if she moved herself around early in the puerperium.

Cæsarean section, when indicated, is a life-saving operation, but there are certain contra-indications to its performance and neglect to heed these has caused many fatalities.

Dystocia, failed forceps, shock and exhaustion of marked degree are conditions that should occur rarely; they are to a great extent controllable. A report by the New York Academy of Medicine, dealing with the mortality caused by these conditions, estimated that 87 per cent of these deaths were preventable, and ascribed responsibility in 90 per cent to the doctor, 7 per cent to the patient, and 3 per cent to the midwife. The report states, "Many of these cases represent instances of gross incompetence, repeated futile operative attempts, gross mishandling of delivery, inability to perform the operations without infliction of severe and dangerous trauma to the birth canal, failure to recognize manifest obstructions and allowing labour to continue until the patient's condition was so critical that any operative procedure would tax her strength beyond its limit."

By adequate ante-natal care is meant the complete supervision and care of the patient during pregnancy and the preparation of her for labour so that she may pass through it easily and safely. It should begin as early as possible in the pregnancy, and the doctor should make the examination and take the history at the first visit. Purposely waiting until the third or fourth month before doing this is to be condemned. The opportunity and value of obtaining a complete knowledge of the pelvis and of treating any intercurrent disease will have been lost by that time. Measurements will have been taken, x-rays also, if necessary. The doctor will know whether the patient's pelvis is such that she can deliver normally, whether she cannot deliver normally, or whether the issue is doubtful, *i.e.*, a normal-sized infant may or may not be born without damage. The doctor is then prepared for the delivery. He may allow a trial labour, sufficient to enable him to judge whether or not the head will engage and come down. Then if it be found necessary, he is in a position to perform a Cæsarean section on a clean case, not on one in which forceps delivery has been attempted.

There should be no such occurrence as failed forceps. This is evidence that someone has blundered. Perhaps the patient is at fault in that she did not attend any doctor until her labour had progressed so far that she was ready for delivery. Perhaps even this is partly our fault. Have we done all that can be done to inform the public of the value of ante-natal care? Perhaps in some instances the doctor

should be made more cognizant of the value of conscientious examinations and care during pregnancy, because if the care be not adequate it may be worse than none at all, as the woman will believe herself protected when such is not the case. What is true regarding the value of ante-natal care in obstetrical complications is equally true regarding its value for intercurrent disease. Stander reports the death rate from cardiac disease in pregnancy is twenty-six times as great among those not receiving ante-natal care as compared to those who do receive ante-natal care.

However, important as is this ante-natal care, more important is the competence of the obstetrician. It is not sufficient that the doctor should recognize the complication if he is not trained in its management. Perhaps the majority of confinements are carried out under supervision of the general practitioner, some being in the home. But if one of the serious complications should arise, then that patient should have the services of an obstetrician who has had training and experience with such conditions. If the doctor who is supervising the case is not qualified to manage the complication, and he will not be qualified unless he has had special training, then he should not attempt to deal with it but should refer it at a time early enough for proper treatment to be effective.

While it may be difficult to compare fairly the statistics of one country with those of another, in some countries, notably Holland and Denmark, the maternal mortality is approximately half that which occurs in Ontario. There, normal confinements are carried out to a large extent by general practitioners and highly trained midwives, but should any complication whatever occur the patient is referred at once to hospital where specialist obstetric services are available. There students spend at least three years in undergraduate obstetric training, and after graduation must spend at least three years more in post-graduate obstetrical training before they are recognized as qualified obstetricians.

The medical colleges in this country do not undertake to train their students as fully qualified obstetricians, but the undergraduate can be trained very completely in the principles of normal obstetrics, ante-natal care, the management of normal labour, minor operative procedures, and the care of the mother during the puerperium. That is all that can be accomplished by undergraduate teaching and is comparable to what the teacher in surgery can accomplish. Yet compare the actions of the recent graduate. He may commence practice after perhaps a year of internship, which may or may not have included obstetrics. As a rule he will not attempt major surgery, perhaps not even a simple appendix but how often does he attempt to build up a practice by doing obstetrics immediately? He will have to deal with grave obstetric difficulties and will learn practical obstetrics from his mistakes. Compare the doctor who takes post-graduate obstetrical training in a good maternity hospital with the doctor who does not do this. The trained doctor when he commences to practise begins on the highest plane possible, he has been trained in the best methods of managing obstetrical complications. On the other hand the doctor without this training will undoubtedly meet difficulties, and his acquisition of knowledge of them will be expensive to his patients. In time, if he is apt and has sufficient practice, he will acquire the art and become more or less proficient, but in the meantime he will contribute to the high mortality rate which carries on from year to year almost unchanged.

When the time comes that the doctor who does obstetrics, or at least who supervises obstetric complications, is a well trained obstetrician, when he has an opportunity to study his patients throughout pregnancy, and when he has at his disposal good hospital facilities, then and only then will the maternal mortality be lowered as far as is humanly possible.

THE PSYCHOLOGICAL AND MEDICAL ASPECTS OF THE EXCESSIVE USE OF ALCOHOL*

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WHILE the medical aspects of alcoholism are of primary importance to the physician these are nevertheless so intimately related to the social, economic and psychological aspects of the use of alcoholic beverages as to make it difficult, if not impossible, to speak only of the medical features.

In recent years there appears to have been a definite increase in the consumption of these products in Canada, as indicated by the following figures, published by the Dominion Bureau of Statistics.[1]

CONSUMPTION OF ALCOHOLIC BEVERAGES

	1922	*1938*
Spirits	2,088,317 gals.	3,493,564 gals.
Malt liquors	38,022,238 "	67,161,168 "
Wines	793,327 "	3,627,943 "

As an indication of the medical reactions of increased use are the figures quoted by Strecker and Chambers[2] from an American insurance company, to the effect that in 1932 male applicants for insurance under the age of 30 were rejected because of heavy addiction to alcohol in the ratio of 11.9 per hundred. By 1936 this ratio had increased to 33.7 per hundred applicants.

Although statistics as to the numbers of persons suffering from chronic alcoholism or alcoholic psychoses are very difficult to obtain, due to the fact that relatively few are admitted to mental hospitals, nevertheless it might be noted that during the earlier years of the prohibition era in the United States the actual rate of admissions to mental hospitals of persons suffering from alcoholic psychoses dropped to less than half the rate in the pre-prohibition years, and has in recent years returned to a much higher level. In New York City alcoholic psychoses accounted for only 2.3 per cent of all admissions to mental hospitals in 1920, whereas in 1934 they accounted for 8.7 per cent of all admissions.

The questions as to why people drink and why some people drink to excess are perhaps not asked often enough, and the answers usually given may seldom be the true reasons. They may be sheer rationalizations, *i.e.*, reasonable sounding explanations which may mislead both the examiner and the drinker; for example, overwork, a nagging wife, sleeplessness, worry, economic difficulties. A clear distinction should be made immediately, however, between the normal, casual, controlled drinker and the problem drinker. The former is the individual who will take a drink as an appetizer, as an adjunct to a meal or at a social gathering. He does not drink to the extent of reducing his ordinary good judgment and control so that he or others might be embarrassed by it. The "problem drinker" (this name having been suggested by Durfee) need not be chronically or frequently intoxicated, the "old soak" type of person. It is perhaps better to regard any person as a problem drinker who even occasionally becomes intoxicated, or to whom alcohol makes a constant or frequent appeal, or who is adversely affected by relatively small quantities, or who feels that he simply must drink at fixed or frequent intervals, or whose drinking interferes with the success of his work or the happiness of his home.

Whether a person is a "normal" drinker or a "problem" drinker the question still needs to be asked, "Why do people use alcohol at all?" As medical men we know that alcohol is a poison, that its medical value is extremely limited, that its food value, while considerable, can readily be replaced by cheaper and much less toxic foods, that it is expensive, that it reduces efficiency even in small quantities, that it diminishes control of dangerous machinery, such as motor cars, while at the same time causing the person to think that he is more than usually skilful; it reduces moral control so that the individual is more likely to engage in improprieties of conduct while under its influence than at other times; there is always the danger of habituation resulting in less efficient and less dependable work, often leading to economic difficulties and domestic unhappiness; in excessive quantities over a long period of time it can do permanent damage to body and mind. With

* Read at the Fifty-ninth Annual Meeting of the Ontario Medical Association, Hamilton, June, 1939.

all these disadvantages, what possible virtues can alcohol have that calls for the expenditure of such huge sums of money, the insistent demands in parliaments and legislatures for the right to drink alcoholic beverages, the willingness to run all the risks and hazards listed in the foregoing paragraph?

It would appear that the chief, if not the only reason for the use of alcohol is that it changes the mentality of the user so that life appears less drab or forbidding than it is in reality. Thus it creates a state of unreality in which difficulties dissolve, in which the ego is enhanced, and in which the individual feels more pleased with himself than he otherwise would. No one can deny to man the right to seek for happiness in this life. For most people life is a constant struggle with an unfriendly environment. The individual is so feeble and the environmental stresses often so ominous that, strive as we will, we can make little impression on them. It becomes necessary at times that we insulate ourselves against the chilling bleakness of life, even as we insulate our bodies against physical coldness by the wearing of clothing. Alcohol might be so regarded. The normal controlled drinker uses alcohol in this way, removing temporarily in some degree those elements in the environment which he dislikes, and at the same time increasing his general feelings of self-satisfaction. While we may regard this type of drinking as normal, we should perhaps qualify it as normal only for the type of environment most of us have to contend with and for the degree of civilization and mental health we have achieved. Surely we can look forward to a time, perhaps a long time hence, when life will be more compatible with civilized desires, when men may no longer need to narcotize themselves to achieve artificially a state of satisfaction and contentment.

The problem of the "problem" drinker is rooted chiefly in personality. If we define personality as the sum total of the individual's physical and mental characteristics and tendencies, inherited and acquired, we will agree that adult personalities vary greatly, and some of them are so frail or poorly and unevenly developed that they find it difficult, if not impossible, to make the barely comfortable adjustment of the average person. Some of these resort to alcohol in excess for the purpose of achieving constant or repeated thrills, or because they find reality so unsatisfactory that they feel a constant urge to get as far away from it as may be possible.

There are two main types of problem drinkers. The first group are usually well-built and attractive, friendly, sociably active, extremely plausible, but indolent, undependable, selfish. They frequently appear to have a too solicitous mother and perhaps a too firm and dominating father. They tend to grow up as "spoiled" boys. The second and smaller group are usually slight or of small stature. They are tense, "nervous", moody, ambitious, hard-working. They are apt to be disturbed by somatic complaints of emotional origin. They appear to be overcompensating for their physical limitations. They find that alcohol lessens their physical and mental discomfort, and they soon find themselves more and more dependent on it. They are seldom sociable drinkers, preferring to hide their drinking habits in the privacy of their own homes or offices.

In these and other groups who may use alcohol to excess, the element of habituation is most important. As with addiction to narcotic drugs it is easy for these frail personalities to acquire a dependence on alcohol. They feel a growing need for larger quantities at more frequent intervals in order to secure the effect they desire. In a relatively small group there may be a decreasing tolerance, so that they receive the desired effect and show signs of intoxication after quite small amounts. However, when the pleasurable effects of alcohol come frequently into his mind, when the drinks at the 19th hole come to be an important objective of the game of golf, when the before-breakfast or even the mid-morning drink becomes a matter of urgency, when the cocktails or the bottle at night become of more significance than the meal or the recreation, then the individual should be made aware that the habituation element is present and that he is now a "problem drinker" and in need of attention.

In passing, the following definition of intoxication by Purves-Stewart[4] is considered adequate. "A drunken person is one who has taken alcohol in sufficient quantity to poison the central nervous system, producing a temporary disorder of the faculties so as to render him unable to execute the occupation in which he was engaged at the time, thereby causing danger to himself or to others."

Although in recent years much stress has been placed on the percentage of alcohol in the blood

as an indicator of intoxication, it is considered advisable, because of individual differences of alcohol tolerance, not to use this test as any positive test of intoxication. The absence of alcohol in the blood would be conclusive proof that the individual was not under any degree of alcoholic intoxication at the time of the test The presence of alcohol in the blood would be equally conclusive proof that he had been drinking recently, but would not justify an opinion of the degree of intoxication. (Concentrations of alcohol in the blood of more than 0.2 per cent by volume are usually considered to be intoxicating).

TREATMENT OF THE PROBLEM DRINKER

Within recent years several excellent monographs have appeared on the subject of alcoholism, in addition to many articles in the journals. Emerson *et al.*,[5] Peabody,[3] Strecker and Chambers,[2] Durfee[6] have contributed excellent presentations, and the reader is referred to them for more detailed information than is possible in the scope of this paper.

It is well known that the successful treatment of the problem drinker is by no means easy, and that relapses are common. It is also known that occasionally such persons may discontinue the use of alcohol as a result of assistance from religious bodies or other non-medical agencies. Whatever the future may have to offer in pharmaceutical or chemical treatment, perhaps akin to the present experimental pharmacological "shock" treatment of schizophrenia and manic-depressive psychosis, for the present, at least, it can be said there is no easy or guaranteed treatment of the alcohol addict. Moreover, any treatment which neglects the personality and psychological factors, or which depends on appeals to the patient's "will power", or concerns itself with moralizing on the folly and harm resulting from its use, is unlikely to have a high percentage of cures. Addiction to alcohol should be regarded as a special type of psychoneurosis, based on a special type of personality, difficulties of adjustment, habituation, and just as definitely motivated, the patient usually not being aware of the motives, but tending to offer a variety of rationalizations for his behaviour.

The usual prerequisites for successful psychotherapy, *i.e.*, the will to be well, and mutual confidence between physician and patient should first of all be sought. The latter is more readily secured than the former. The deep, if temporary, satisfactions offered by alcohol, hold him strongly, and he resists efforts made to deprive him of these satisfactions. Or he feels he can take care of the situation without medical help, and until he has convinced himself that he cannot handle alcohol, he will resent and fail to co-operate with compulsory treatment.

Treatment having been agreed on, the first point to be decided is the question of hospital care. As contrasted with narcotic drug addiction, in which proper treatment cannot even be instituted without some type of institutional care, the problem drinker may not require hospital supervision. However, if he is verging on delirium tremens, or is physically depleted, or is obsessed by a compulsion to drink, hospital care should be utilized. Even where symptoms are less severe than those just mentioned, hospital may be advised in order to secure good supervision, complete physical and laboratory examinations, for the institution of proper diet, and to change certain habit routines which may have conduced to alcoholic habits, and, finally, to provide a proper environment for regular psychotherapeutic conversations.

Where symptoms are even less urgent and the patient entirely co-operative hospital care may be contraindicated. Nevertheless, a full history, complete physical examination, personality inventory, and correction of physical disturbances, especially dietary errors, should be immediately undertaken.

In connection with proper diet, it should be noted that in many cases the individual has been using alcohol with its vitamin deficiencies as a substitute for food. Diet should therefore be varied, ample, rich in vitamins and carbohydrates. It is good practice for the patient always to carry package candy or chocolate bars with him, and to nibble at them frequently, especially at those times that he may formerly have been in the habit of taking a drink.

Strecker recommends that psychotherapeutic conversations cover about 100 one hour periods spread over a year, at the rate of three a week to begin with, but with longer intervals between them as treatment progresses. One or more relapses should not discourage the physician in the earlier treatment phases, but the physician should regard these unemotionally. At all times the responsibility for recovery as well as for relapses should be placed on the patient and should not be accepted by the physician. Relapses will call for more frequent treatment

hours as well as a complete investigation into the circumstances surrounding the relapse.

Most problem drinkers in accepting treatment do so in the hope that they will be able to become "normal" drinkers. They feel a sense of inferiority at their own inability to handle liquor and an envy of those who can. Liquor has meant so much to them that they cannot conceive of a satisfactory life without it. While it may not be advisable in the early stages of treatment to tell the patient that total abstinence for life will be necessary to his safety and happiness, nevertheless, this objective should appear in due course. The suggestive title of Strecker's book "Alcohol—One Man's Meat" can be used for a discussion of allergy, psychic allergy and alcohol allergy, and the patient should grasp the principle that he should feel no more sense of inferiority over his inability to drink than the hay-fever patient need feel over his inability to handle ragweed or whatever proteins to which he may be allergic.

During these treatment hours the attempt is made to get a full understanding of all the personality factors that are involved, to explain to the patient the real motives behind his rationalizations, and to re-educate him through progressively higher levels of adjustment, aided by the learning of new and better habits, new and better escape mechanisms, to a level where he has a good understanding of all these factors and at which alcohol no longer has a real appeal to him. That this is not an easy task goes without saying.

In the discussion of escape mechanisms there might be a fairly full presentation of the need for escape, that all people need some relaxation from the constant struggle, that all ships seek a protected harbour when the storm becomes too threatening or even put into dry dock for overhauling and repairs. Fight and flight are our two ways of dealing with the environment and we cannot always be fighting. The types of escape which add something to life and personality should, however, be sharply differentiated from those which tend to take something away from personality. We should therefore attempt to replace the unsatisfactory alcoholic escape with a more useful escape, such as an interest in books or the arts, physical and mental recreational activities, both as spectator and participant, some altruistic group activities, and hobbies. Hobbies are necessary to supply the emotional satisfaction of achievement which our daily work may fail to provide.

In speaking of his daily work the patient will not infrequently rationalize by blaming the strain and worry of his work for his alcoholic indulgence. If he does not blame his work he blames his wife. But neither the work nor the wife should be changed if he is simply rationalizing. Certainly every effort should be employed to effect a satisfactory adjustment at his regular work. If the physician comes to an independent conclusion that his patient's regular work is quite unsuited to him and one to which he can never hope to make a good adjustment, then he should not hesitate to advise a change. It is better for the physician to let a third party advise as to the particular work for which the patient is suited so that the physician-patient relationship not be disturbed in its medical aspects. The patient should also undertake the reading of carefully selected literature, such as Peabody's "The Common Sense of Drinking". The physician can discuss this book with the patient, chapter by chapter, helping the patient to understand himself and his reactions.

While it is important for the patient to cultivate new and more constructive habit routines, it should be recognized that the wide prevalence of alcoholic use makes it impossible for him to avoid all contact with it. Important as it is for him to avoid close companionship with those who would encourage him to drink, he should nevertheless learn the habit of a cultivated indifference to whatever drinking others may indulge in, and at such times he should force himself to remember not the pleasures of alcohol but the miseries it has caused him.

Alcoholic addiction is potentially curable in those persons whom we have been considering, although cure is by no means easy and relapses not uncommon, until the individual reaches a higher level of integration with his environment and is prepared to find satisfaction in life on a non-alcoholic basis.

As a part of the psychotherapy reassurance and strong positive suggestion should be sufficiently stressed. Many patients have little hope of being cured, the result of repeated failures at self-cure, it is very important that the physician present to the patient an optimistic attitude if he accepts the patient for treatment. So much negative suggestion, coupled with the patient's strong liking for the effects of alcohol, makes the problem very difficult and if the

physician shows any lack of confidence, either in himself or in the patient, he is only wasting his own time and the patient's money. The "bottled cures" put out by charlatans have always been offered to the patient and his family with the utmost assurance, often giving the impression that there is some rare and precious ingredient in the cure, known only to the vendor, which will not only have a positive and specific curative influence on the alcoholism itself but will also lead to a lack of desire and repugnance to alcohol in the future. This is re-enforced by the high price usually charged for such magical remedies. You, as physicians, know there can be no truth in the statements made, and they should have no part in the ethical treatment of the problem drinker. The value of such treatment, where it has been of apparent help, has lain in the strong positive suggestion and reassurance given the receptive patient.

Acknowledging the value and importance of such suggestion, the physician should use it in a rational and ethical manner. At every interview therefore optimism and confidence should be expressed and the assurance thus given will re-enforce the re-educative personality adjustment which is the main part of the treatment. Strecker recommends that the therapeutic conversations be conducted with the patient thoroughly relaxed, for part of the hour at least, during which time strong positive reassurance and suggestion is made as to the patient's steady progression to a state of self-control and the diminishing appeal of the alcoholic effect. It is a well known fact that in hypnotic sleep as well as in states of relaxation generally suggestions made have a stronger effect than those given when the patient is tense, preoccupied, worried or resentful. The patient should also be encouraged to practise physical and mental relaxation at stated times throughout his regulated daily routine activities. At these times he should also turn his thoughts to the distress alcohol has caused him and express to himself his own assurance that he is becoming a stronger, more self-confident personality.

The physician should realize that there are other types of alcoholic addicts who should not be accepted for treatment of their addiction. These would include (1) persons who do not want to be well; (2) alcoholic psychopaths whose psychopathy has shown itself since childhood by constant failure to adjust and usually associated with other types of behaviour disorder, such as swindling, or chronic immorality; (3) manic-depressive psychosis, in the manic phase of which the immoderate use of alcohol is a not uncommon symptom; (4) mental deficiency associated with alcoholism.

No attempt has been made to discuss the alcoholic psychoses in this paper—delirium tremens, alcoholic hallucinosis, alcoholic paranoia, Korsakoff's psychosis. While these are the outgrowth of prolonged and excessive use of alcohol they are also definitely related to special types of personalities and personality reactions. Without going into details, it should be noted that the successful treatment of an alcoholic psychosis must also include treatment of the personality problems as I have attempted to outline them in the body of this paper.

In conclusion it might be stated that the thorough and persistent treatment of the problem drinker by psychotherapeutic means warrants a much more optimistic prognosis than has formerly been accorded it.

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The mystery of how sulfapyridine and sulfanilamide cure pneumonia and other serious ailments has been practically solved and as a result scientists at Washington University School of Medicine are now starting to make drugs of quite different chemical composition which they hope will be even more effective remedies for human diseases. The secret of sulfanilamide's success in curing disease depends, Prof. Philip A. Shaffer reports (*Science*, June 16th) on what it does with oxygen picked up, not from the air you breathe, but from the cells in your body. Other chemicals that do a better germ-killing job through this same mechanism can probably be found, Prof. Shaffer predicts. Discovery of what sulfanilamide and sulfapyridine do with oxygen to cure disease also explains why they sometimes cause poisoning symptoms in the patient. These drugs, Prof. Shaffer explains, provide "a mechanism by which the sterilizing oxidation intensity of molecular oxygen is applied nearly at its maximum to bacteria and unavoidably also to some extent to host cells."—*Science News Letter*, July 8, 1939, p. 20.

POLLEN DISEASE IN WESTERN CANADA*

BY CHARLES H. A. WALTON, M.Sc., M.D.(MAN.)

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IT is more than a century ago that Bostock[1] wrote his classical description of Catarrhus Æstivus or hay fever. A third of a century later Blackley[2] established the fact that this disease was due to sensitivity to air-borne pollen. Although it is now known that seasonal rhinitis and asthma are occasionally due to other air-borne factors such as fungus and rust spores, insect débris, etc., pollen is undoubtedly the important factor in most cases. Obviously the successful management of diseases caused by pollen must be based on an accurate knowledge of local pollen characteristics. There is no doubt that there are many sufferers from pollen in the prairie provinces but unfortunately little information has been available as a guide in diagnosis and treatment. Indeed much misinformation exists. The large drug houses selling pollen products publish much that is incorrect and we find our railways and tourist agencies advertising grossly inaccurate statements regarding our supposed freedom from hay fever.

References in the literature are practically non-existent, and the few that one does find dealing with pollen in western Canada are fragmentary and vague and often appear to be based on analogy or assumption. Durham[3] examined slides exposed in Winnipeg several years ago and reported very low ragweed pollen counts. Jamieson[4] reported a brief botanical survey of Alberta. These reports are the only ones that I am aware of that were based on actual studies of conditions in western Canada.

With assistance from the Banting Foundation, we are at present engaged in a pollen survey of Manitoba and hope soon to publish some definite data on this subject. It is my desire in this paper to present a short outline of our flora, what we have learned about atmospheric pollen, and to indicate in a short clinical report our experience with pollinosis.

* From the Department of Internal Medicine, University of Manitoba.

Read at the Seventieth Annual Meeting of the Canadian Medical Association, Section of Medicine, Montreal, June 22, 1939.

ANEMOPHILOUS FLORA

As far as we are aware no list of hay fever plants has ever been prepared for western Canada. At present we are attempting to compile such a list for Manitoba. As the data are at present very incomplete I will only indicate very briefly the main groups and what we know of their characteristics. We have taken as a guide the excellent list compiled by Ellis and Rosendahl in Minnesota[5] and have found that our list will follow it quite closely in main outline. In general our dates of pollination are one month later than those in the region of the Twin Cities. It appears that there are nearly 190 wind pollinating plants in Manitoba, but it is likely that less than a third of these will prove to be sufficiently abundant to be clinically important.

It is probable that the trees and grasses have not changed materially with the development of the west, but as the country has been brought under cultivation native weeds have undoubtedly become more prevalent and many serious new varieties have been introduced. This process appears to have been greatly accelerated by the cycles of drought which we have experienced and there is considerable clinical evidence to suggest that the recent prolonged and devastating drought in western Canada has increased the amount and severity of weed pollinosis.

Early in April we occasionally find weed-pollen grains on our collecting slides, *e.g.*, ragweed pollen or that of the Russian thistle. We are not certain of their origin but suspect that they were produced in the preceding autumn, lay dormant in the dust all winter, and then were blown into the air with the drifting surface soil.

The earliest pollen, of course, is that derived from the trees. Tree pollination is heavy in many parts of Manitoba and is quite important in many of our cases. Tree pollination tends to be rather irregular and patchy, so that the season is apt to spread over a period of five or six weeks. The first pollen found on our exposed slides appears about April 24th and is

derived from the poplars and hazels. The count of these pollens rapidly reaches its height in the first week in May and is succeeded by pollens from the willows and birch. There are some 18 members of the poplar-willow group (Salicaceæ) and 11 of the hazel, alder and birch group (Betulaceæ). As the three provinces extend northward for great distances it is important to realize that pollination dates referred to are for the southern and most populated areas. The birch is the chief wind pollinator in the north, and, of course, its flowering season extends into June producing symptoms in that month in some of our northern cases.

Three species of maple (Aceraceæ) are found here, but the only one that is abundant is the so-called Manitoba maple or box elder (*A. negundo*). Its pollen and that of the American elm occur in large amounts at the end of April and, irregularly, into May. The nettles, relatives of the elm, do not pollinate until late June but their clinical importance is uncertain. The green and black ash both occur, but the former is much commoner. It pollinates in the second week in May. The only naturally occurring oak is the scrub or bur oak (*Quercus macrocarpus*). It is very widespread and abundant, and grows to a large size in the Red River valley. It commences to pollinate heavily after the middle of May.

Apart from the trees, the only other wind-borne pollen occurring in the early spring is from the sedges (Cyperaceæ) which are common and of many species. Their clinical importance is at present very doubtful.

During the latter part of May and early June there is a temporary lull in pollen production until the grasses start to bloom. There are more than 75 species of grasses belonging to some nine tribes. Agriculturally, some are noxious weeds. In general, the grasses commence pollinating early in June and reach their height late in that month. Many species continue to produce pollen throughout the summer but the worst of the season is over by the first week in July. The earliest flowers are seen in June or Kentucky blue grass (*Poa pratensis*), and these are followed closely by timothy (*Phleum pratense*), red top (*A. alba*), Canada blue grass (*P. compressa*), brome grass (*B. ciliata*), a noxious weed, quack grass (*A. repens*) and numerous others. The vernal group carry on actively through July and of course the cultivated cereals pollinate late in July. However, it is probable that these are not of great importance as causes of pollinosis. A few species such as the Gramma grasses and the sorghums pollinate in August and September. Their clinical importance is not known, but it is possible that further study may show them to be of some importance in our late summer cases, accounting for some of our failures to obtain satisfactory results from weed-therapy.

The docks and sorrels are widespread but their clinical significance is not clear at present. They pollinate from June 15th to July 31st.

There are seven common species of legumes or members of the clover-alfalfa family. They are not true wind-borne pollen plants but seem to be of some importance in rural cases. Pollination occurs throughout the summer.

There are four common species of plantain, the commonest of which is the common plantain (*Plantago major*). Its pollen is known to be quite toxic and is a factor of importance in some of our cases. Pollination occurs through most of the summer.

We find three common amaranths or pigweeds. Of these the most widespread and abundant is the redroot pigweed (*Amaranthus retroflexus*). It is a very troublesome noxious weed, thriving well in cultivated soil and particularly in gardens. It is probably increasing. This brings us to a consideration of the three most important groups of weeds in the west, important not only in pollen disease but agriculturally.

Undoubtedly the ragweeds are the most important cause of pollinosis in the older and more populous sections of the continent. I understand that for practical purposes it may be considered as the only important cause of fall hay fever in those areas. It is probable that this is the reason that much misinformation exists about our pollen problem, because, admittedly, our ragweed pollen count is low in comparison with most other areas. However, we have at least 9 common species of the ragweed group of compositæ in the west. They are very widespread and I believe are becoming more abundant. Possibly the pollen of this weed will become increasingly important in the future, as has happened in other areas, but as will be shown later it is only one of several important factors in our fall cases. The three most important species are the giant and western ragweeds (*Ambrosia trifida* and *A. psilotachya*) and the burweed marsh elder (*Iva xanthifolia*).

One of the other most important groups of weeds in the prairies is the Russian thistle group or chenopods. There are at least 16 common species, widely spread and growing most abundantly, particularly in the dry southern and western areas. The Russian thistle itself was introduced into the west about sixty years ago and has become a very serious problem. It thrives in cultivated soil with a minimum of moisture and a great deal of sunlight. It became so widespread during the current drought that it was cut and used as fodder, and was even credited with helping to save some of the farm stock. In wet years it is stunted and overshadowed, and, although not apparent, being hidden by the crops, it still grows abundantly, and after the crop is cut, if the fall is dry and sunny, it grows rapidly and luxuriantly, and finally in the late fall the large plants break off at the ground level and tumble about the ground, scattering their seeds widely. The plants are carried far by the wind and are often seen blown into great snow-like drifts. As the pollen from this weed is plentiful and toxic there is little wonder that we see many patients whose trouble is chiefly or solely due to its pollen. It is not uncommon to see late summer cases of pollinosis which are not sensitive to ragweed, so that the commonly advised use of stock ragweed vaccine would be useless in many cases.

The third important group of weeds is the sage group. We are familiar with some 10 species of the artemisias. These are commonly thought of as being associated with very dry areas, and one is accustomed to think of such examples as sagebrush in desert-like regions. However we often find heavy growths of such species as the prairie sage (*Artemisia ludoviciana*) thriving in heavy soil with good precipitation. Sage-pollen counts are seldom very high, but the pollen is very toxic, and, clinically, we think that the sages are very important causes of pollinosis.

This rather sketchy account will give some idea of the flora of western Canada which produces significant amounts of toxic wind-borne pollen and its probable importance. When our studies of atmospheric pollen are more advanced diagnosis and treatment of pollinosis in the prairie provinces should not only be more simplified but much more accurate and effective.

CLINICAL EXPERIENCE

I am unable to offer any definite evidence of the actual prevalence of pollinosis in the prairies, but my impression is that it is very much more prevalent than is commonly believed. Perhaps there has been a tendency to look upon these cases as rather harmless and even funny. In many instances very little was done for them other than palliation, and as a result many patients do not present themselves for treatment until the alarming symptoms of asthma appear. That this complication is not uncommon is borne out by the reports of many authors, and in my own limited experience nearly 50 per cent of pollen cases have some degree of asthma. The tendency for seasonal asthma to become perennial is well known, and I feel that this is one of the most important reasons why the subject of pollinosis deserves serious consideration.

As an indication of the relative importance of the various factors considered above I have summarized some of the salient features in a series of 148 cases which I have seen in the last few

TABLE I.

SEASON OF SYMPTOMS AND CAUSES FOR 137 PATIENTS

Apr.	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Causes*	*Number*	*Percentage*
———							Trees	2	1.5
		———					Grasses	24	17.5
				———			Weeds* (not ragweeds)	23	16.7
				———			Ragweeds	8	5.8
								57	41.5
———		———					Trees and grasses	10	7.1
———		———		———			Trees, grass and weeds*	7	5.1
———				———			Trees and weeds*	14	10.2
———				———			Trees, weeds and ragweeds	8	5.8
		———		———			Grass and weeds*	8	5.8
		———		———			Grass, weeds and ragweeds	9	6.1
				———			Weeds* and ragweeds	24	17.5
								137	99.1

* Includes all weeds other than ragweeds; chiefly pigweed, Russian thistle and the sages.

years. Table I shows the season of symptoms and causes in 137 cases. A diagnosis could not be made in 11 cases, although the history definitely suggested pollinosis. I attributed this to the fact that our knowledge of the pollen problem in the west is far from complete.

SUMMARY (TABLE I)

1. *Trees* provided the sole cause in only 2 cases, but were an important factor in 39 others, *i.e.*, in 30 per cent of the cases.

2. *Grass* pollen was the only factor in 24 cases, but was an important factor in 32 others, *i.e.*, important in 42.4 per cent of the cases.

3. *Weeds* were a factor in 101, or 73.9 per cent of the cases, but of these ragweed sensitivity occurred in only 49, or slightly less than half the weed cases. It was the sole factor in 8 cases, or 5.8 per cent of the total.

TABLE II.

ANALYSIS OF CASES

	Number	*Percentage*
Hay fever (only)	75	50.7
Hay fever and asthma	56	37.8
Asthma (only)	17	11.5
	148	

Almost 50 per cent of my cases of pollinosis had some degree of asthma, and this agrees very closely with many published series. It has been claimed that 50 per cent of all pollen cases are apt to develop some asthmatic symptoms, but this seems to me to be too high, for the reason that pollen patients with asthma are much more likely to seek competent advice than those with only nasal symptoms. However the large proportion does emphasize the importance of a study of pollinosis in preventive medicine.

TABLE III.

SEX INCIDENCE

Females	75
Males	73

Sex incidence is usually equal.

I doubt if it is generally appreciated that pollinosis frequently develops early in life. In this small series it started in the first decade in 25 per cent of the cases and this figure is similar to that reported in most centres. Heredity is well known to be an important predisposing factor in allergic diseases. Table V shows that I found it important in nearly two-thirds of the cases. This is also the usual experience.

TABLE IV.

INCIDENCE OF AGE AT ONSET

Decades	*Number*
0 – 9	37
10 – 19	31
20 – 29	27
30 – 39	23
40 – 49	28
50 and over	2
	148

TABLE V.

INCIDENCE OF HEREDITY

	Number	*Percentage*
Bilateral	38	64.2
Unilateral	57	
None	53	35.8
	148	

Allergic manifestations are often multiple and Table VI shows that we had other non-pollen allergic manifestations in 36.4 per cent of the patients at some time in their lives, past or present.

TABLE VI.

ASSOCIATED ALLERGIC CONDITIONS

	Number	*Percentage*
Urticaria	27	17.9
Eczema	14	10.0
Dermatitis	11	7.2
Others	2	1.3
None	94	63.6
	148	

SUMMARY

Pollen disease appears to be quite prevalent in Manitoba and western Canada, but botanical data on which to base practice are at present lacking. A pollen survey is under way and will be reported later.

Our present knowledge of the flora producing wind-borne pollen in significant amounts is summarized. Trees and grasses are, of course, very important, and several weeds, notably Russian thistle, the sages and pigweeds, are found to be as important as ragweeds, if not more so.

A small clinical series is analyzed.

I desire to acknowledge my indebtedness to the Manitoba Department of Agriculture, to Dr. R. E. Bird, of the Dominion Entomological Branch for photographs, to the Department of Botany of the University of Manitoba for advice, to the Banting Foundation for assistance in initiating the study, and finally to Margaret G. Dudley, Ph.D., who has been closely associated with me in this work.

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Case Reports

A CASE OF TYPHOID FEVER TREATED WITH DAGENAN*

BY J. H. STANYON

Levack, Ont.

History.—H.D., aged 24, was a transient who had journeyed from Alberta chiefly by means of freight train. He had eaten and drunk along the way whatever and whenever he could. He obtained work in a mine, and commenced on May 25, 1939. On May 28th, he went to work as usual, but as the day progressed he developed a frontal headache. He managed to finish his shift, but with great difficulty because of the severe headache and a pronounced "all in" feeling. Immediately after work he went directly home to bed. During the night he developed diarrhœa and was forced to get up several times. The following morning he felt extremely weak and was content to remain in bed. He remained in bed for two days, and then as he failed to improve a doctor was called and he was sent to hospital.

Examination.—The patient was a young, adult male, lying quietly in bed. His face is flushed and his pupils widely dilated. He appeared acutely ill. Temperature 103°; pulse 58, respirations 20. The pupils were dilated, reacted to light and accommodation. The face somewhat flushed. The tongue dry and heavily coated, and had a coarse tremor. The posterior pharynx was slightly injected.

The chest was normal.

The apex beat was palpable in the fifth left interspace in the nipple line. Rate, 58, regular in rhythm and rate. There was a soft blowing systolic murmur at the apex. Blood pressure 90/78.

The abdomen was very slightly distended and moved on respiration. There was no tenderness or rigidity. The spleen was just palpable. There were several light pink, slightly raised spots, averaging 2 mm. in diameter.

Nervous system.—The patient appeared very languid, and was fully conscious. The cranial nerves were normal. The motor system was normal; reflexes active and equal. Sensation was unimpaired.

Laboratory examination.—Urine: specific gravity 1.030; reaction, acid; albumin, a trace; amorphous urates in large amounts; and occasional hyaline cast. *Blood*: hgb. 95 per cent; white blood cells 6,200, 6,000, 7,000; polymorphonuclears 42 per cent; lymphocytes 56 per cent; eosinophiles 2 per cent. The Wassermann test was negative. Widal test was positive for *B. typhosus*. Blood culture was positive for *B. typhosus*. Fæces were dark grey in colour, liquid, and contained no blood.

This patient was placed on a high caloric low residue diet, and given the usual routine care. He was observed for a period of three days during which his temperature hovered between 102 and 104°, and there was little change in his general condition. On June 3, 1939, he was placed on dagenan, gr. 15, soda bicarbonate, gr. 10, every four hours. In twenty-four hours his temperature had fallen to 100°, and within forty-eight hours was 99°. Dagenan was then reduced to half dosage, and on June 6th, his temperature was normal, and for the following three days remained normal, with the exception of one afternoon rise to 99.2°. Following this his temperature became subnormal, dagenan was gradually discontinued, and the patient had made an apparently good recovery. On June 10th he was feeling fine, with an enormous appetite and very anxious to resume his normal activities. He was released June 15th after two negative stools were obtained and returned to work June 26th.

Dagenan was used in this case for want of more specific therapy. When it is considered that such compounds exert a definite bacteriostatic and bactericidal action on *B. coli*, it is reasonable to expect a similar action against *B. typhosus* which it so closely resembles in so many respects.

* This is an important observation excellently worked out. The result from the use of dagenan seems spectacular. At the same time it should not hastily be concluded that dagenan is a specific for typhoid fever. There is evidence to the contrary. It is well known that in typhoid there is a tendency to leukopenia and the sulfanilamide group of drugs also tend, if pushed, to produce the same condition. Therefore we would advise caution in their use. We think that before we can establish the value of the sulfanilamide group in the treatment of typhoid fever we should have many more clinical observations. To be of value the cases should be very carefully worked out, with details as to the Widal reactions and cultures from the blood and fæces, so that we know exactly what we are dealing with. Frequently repeated blood counts ought in all cases to be made.—[ED.]

STRANGULATED INGUINAL HERNIA IN INFANTS

BY R. B. EATON, B.Sc., M.D., C.M., F.R.C.S.(EDIN.)

Amherst, N.S.

Although inguinal hernia is probably one of the commonest congenital anomalies in infants, the complication of strangulation is considered to be rare. For this reason the following case is reported.

CASE REPORT

Baby C., male, aged 4 weeks, admitted to hospital within 8 hours with a history of a lump in the right inguinal region.

History.—Birth normal; weight 8 lbs.; no congenital anomalies were noticed; breast fed. He was gaining

weight satisfactorily and appeared healthy until 3 days before admission, when he became fretful and cried more than usual. The day before admission he vomited after his early morning feeding. Boiled water was substituted for his usual feedings, on which he continued the rest of the day without vomiting. His bowels not having moved for 24 hours the mother gave a glycerine suppository with good results. On the day of admission, after his early morning breast feeding he cried violently as if in pain. Shortly after this, at 7 a.m., a lump in the right inguinal region was first noticed. Milk of magnesia was given by the mother as his bowels had not moved since the suppository. This was followed by a copious quantity of yellow vomitus. An unsuccessful attempt at reduction of the lump was carried out under chloroform anæsthesia. Vomiting continued off and on until admission to hospital.

Examination.—He was a well nourished infant, crying lustily; temperature 103.4° (rectal). He vomited bile-stained material at the commencement of the examination. The abdomen was markedly distended and tympanitic on percussion. A lump the size of a hen's egg was visible in the right inguinal region, extending into the scrotum. The overlying skin was reddened and œdematous, and on palpation the lump felt tense. Rectal examination revealed no abnormality, but some blood-stained mucus was noticed on the examining finger. A diagnosis of strangulated inguinal hernia was made.

Operation.—Local infiltration (2 per cent novocain). By using an oblique inguinal incision the sac was carefully exposed and delivered. It extended well into the scrotum—a complete funicular type of hernia. The site of constriction was at the internal abdominal ring, the surrounding muscle layers appearing tight as if in spasm. On opening the sac, free serosanguineous fluid escaped, together with a loop of small intestine 3½ to 4 inches long. The involved loop was purplish-red in colour, hæmorrhagic, swollen and œdematous. The testicle also presented a similar appearance. By the use of a grooved director the constriction ring (which appeared in the neck of the sac) was cut, in an up and outward direction. The loop of intestine was freed and covered with hot saline packs. The colour improved, except for two blackish areas ½ inch in diameter on the antimesenteric border of the proximal loop at the site of the constriction. Considering the fact that these areas were not lustreless, that an attempted reduction had been performed, together with the age and condition of the infant, the gut was returned to the abdomen. At this stage a few drops of open ether were administered. The sac was removed, leaving its distal end open and the testicle replaced in the scrotum. The wound was closed without drainage and a collodion dressing applied. This was covered with a crepe spica bandage; 150 c.c. of 5 per cent glucose and saline were given via the right saphenous vein.

Soon after operation flatus was passed, followed by a bowel motion. Some blood-stained mucus was noticed in the stool. Vomiting ceased. The child was fed with small quantities of glucose water for the first 12 hours; thereafter breast feedings were continued q.2.h., reducing the nursing time to 10 minutes. Fifth day: the dressing was changed owing to contamination with urine. Seventh day: the skin sutures were removed. The wound had healed except for some local infection around the sutures. Eighth day: discharged. The baby was taking regular breast feedings and the bowels moving regularly. Four weeks later: the baby was healthy and gaining weight. His right testicle felt small and atrophic, the mother having been prewarned as to its viability.

DISCUSSION

This is an example of strangulated inguinal hernia in an infant 4 weeks old. Inguinal hernia in infants is always due to a preformed sac, *i.e.*, failure of the usual closure of the processus vaginalis which precedes the descent of the testicle in the male, and during the development and the attachment of the round ligament in the female. The hernia may be either a complete or incomplete funicular type, the latter occurring in about 95 per cent of cases. Most inguinal herniæ in infants are reducible, and even in those that are irreducible strangulation is rare. Herzfeld,[1] of the Children's Hospital, Edinburgh, states that true strangulation in infants, *i.e.*, with interference with the blood supply practically never occurs. She quotes one case in an infant 12 days old in a series of 1,000 cases of infantile inguinal hernia, requiring resection of an early gangrenous loop. Sir John Fraser[2] says there was not one case of strangulation in 10,000 cases of hernia in Edinburgh Children's Hospital. He makes a definite distinction between true strangulation and obstruction or incarceration. Hamilton Bailey[3] quotes 6 cases under 3 years, including one 3 weeks old and one 3 months, the last involving the ovary, the others the small intestine. Barrington-Ward also states that the condition is rare. Thorndike and Ferguson,[4] of Boston, quote 5 cases of strangulation in a series of 1,700 cases in children under 12 years. They also described over 100 cases of irreducible inguinal hernia.

Although the case described did not require resection of the involved intestinal loop, ultimate gangrene was inevitable, thus removing it from the category of incarcerated or irreducible hernia.

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Therapeutics and Pharmacology

THE CARE OF THE SKIN OF NEWBORN INFANTS*

BY ALAN ROSS

Montreal

During the last months of fetal life there accumulates over the surface of the skin a large or small amount of vernix caseosa, which is composed of masses of desquamated epithelial cells held together by secretions of the sebaceous glands. This forms a thin wall between the liquor amnii and the skin itself. As a rule this coating is removed with some friction, using either oil or soap and water soon after birth. There follows, in a very considerable number of cases, a variety of skin lesions, to which a variety of terms have been applied. I am not anxious to become involved in a discussion of dermatological terms. Suffice it to say that as a result of this confusion of terms it is well nigh impossible to estimate the incidence of skin lesions in the newborn or to evaluate methods of treatment or prevention. It would seem most practical to adopt Sanford's simple classification: (1) non-pustular lesions; (2) pustular lesions; (3) pustular, with exfoliation. The non-pustular lesions are of two types: (*a*) urticarial and (*b*) irritative. The former always evokes wide speculation. The latter are due to a great variety of irritants, *viz.*, clothing carelessly laundered; antiseptics including ointments; alcoholic solutions and dusting powders; moisture due to oils and perspiration; and soaps. A certain number of these multiform lesions eventually go on to the pustular type.

The pustular lesions seen in the newborn period fall into two large groups, the most common, that which is usually termed pemphigus neonatorum. This consists of transparent vesicles which tend to spread and coalesce, and contain fluid which at first seems clear but which rapidly becomes cloudy. These vesicles are most fragile and when broken leave a red, raw, flat denuded area. They are surrounded by very little induration. The other type of pustule appears to be deeper in the skin and is surrounded by more induration. They have no tendency to coalesce and are surmounted by a pin-point abscess of yellow pus which is broken with considerable difficulty. Since between these two there are innumerable intermediate forms, and since from both the *Staph. pyogenes* can be frequently isolated it would seem inadvisable to do more than group them together under the term "pustules". It is interesting to observe at this point that whereas the *S. hæmolyticus* is usually present in impetigo of the older children that the staphylococcus is the common organism present in the newborn. Their relation to the etiology of both diseases is obscure.

The third group in the classification is pustules with exfoliation. This is Ritter's disease, or exfoliative dermatitis, which is now rarely seen in this country and in which the death rate is from 50 to 80 per cent.

The treatment of the non-pustular lesions obviously involves a search for the causative agent and its removal. The pustular lesions if attacked early can be treated in a variety of ways with about equally satisfactory results. The following may be tried. (1) Ammoniated mercury ointment; (2) bichloride of mercury; (3) alcohol; (4) calamine lotion; (5) ultra violet light; (6) dry heat; (7) gentian violet; (8) tannic acid; (9) silver nitrate; (10) antiseptic dusting powders. In our hands the most effective has been an antiseptic powder introduced by R. R. Taylor in 1929. It consists of calomel 3 parts, talcum 2 parts, and zinc oxide 1 part. It has the advantage of being only occasionally irritating and not caking in the folds of the skin. The lesions usually dry up within four days under this regimen.

Since the pustular lesions tend to occur in epidemics and frequently show the staphylococcus on culture, we are presumably dealing with an infectious disease. Prevention then must be our aim, and there are two lines along which such measures should proceed: (1) to keep from the infant all pathogenic organisms; (2) to maintain at a high level the resistence of the skin.

To exclude organisms from the infant we must study all possible sources: (1) other infants; (2) septic adult patients; (3) hospital personnel; (4) mothers; (5) outsiders. A rigid regimen of aseptic nursing must be maintained.

The second effort must be to maintain the skin of the infant in a high state of resistance. In 1925 the practice was started in Boston, which has spread throughout the continent, of a general inunction of all newborn babies with 2 to 5 per cent ammoniated mercury ointment after a soap and water bath. From time to time the procedure has been criticized by toxicologists, who feel that kidney damage, even late in life, may be produced, and by allergists, who suggest that thousands of children are being made sensitive to mercury. Neither however have produced any very convincing evidence to support their claims. As I see it, after a fairly complete review of the literature, there are two objections to it—first, a number of minor skin irritations result, and, secondly, it does not very appreciably reduce the incidence of pustular dermatitis.

* Read at the Seventieth Annual Meeting of the Canadian Medical Association, Section of Obstetrics and Gynæcology, Montreal, June 22, 1939.

The most recently advocated prophylactic measure was introduced by W. F. Patrick in 1931, and has been practised extensively in the United States since then. The procedure requires a complete "hands off" program as far as the baby's skin is concerned from birth to discharge from the maternity hospital at about 14 days. Excess blood and vernix is wiped off the head and face with sterile water at birth. The baby is dressed and diapered and not bathed. In 48 to 72 hours almost all the vernix disappears, except in the creases which may be dried up by the use of the dusting powder already mentioned. This has certain definite advantages, at least theoretically, over other methods. (1) It reduces exposure to infection (I., U.R., skin); (2) reduces exposure to cold; (3) reduces trauma to skin (rubbing, oils, soaps, ointment); (4) saves materials ($200 to $300 yearly, in the average maternity hospital); (5) saves nursing time (2 months of nursing time annually for 30 babies). It is logical and statistically seems as satisfactory as any other method but is not the Utopia that it was at first thought to be. If a pathogenic organism is allowed to enter the nursery it may still start an epidemic of purulent dermatitis even among the unwashed. Our experience in our hospitals in Montreal has been that any one method of caring for the skin of newborn infants has little to recommend it over any other, and has reemphasized the fact that more important than this aspect of the problem is strict attention to aseptic technique and early isolation of all pustular skin lesions during the first two weeks of life.

CHALAZION

BY S. GOLD, M.D.

Montreal

The occurrence of infection in the Meibomian glands is common in people whose eyes are subjected to constant strain and prolonged mechanical or chemical irritation. Congestion of the conjunctival membrane is a predisposing factor in the production of an acute inflammation in these structures. Here, as in many other inflammations, one must consider two main factors as operative: (1) the predisposition of the body to this type of infection; and (2) the presence of an exciting agent, chemical or mechanical. Dust, smoke and chemical vapours, if allowed to act on the conjunctiva for a long enough time, will establish a state of chronic congestion, with a predisposition to the formation of Meibomian cysts. The congestion which paves the way for an acute exacerbation is often caused by eye-strain from refractive errors, local irritation, or is part of a general congestion.

The conjunctiva may also become congested as part of a temporary general congestion such as follows the ingestion of a sufficient quantity of alcoholic beverages. Here one often finds both the local and general effects operating. The alcoholic vapours cause a local irritation of the conjunctiva, whilst, as part of the general congestion which follows after the stimulating effect of alcohol has worn off, the conjunctiva also becomes congested.

The congestion of the conjunctiva preceding the more active inflammatory reaction of an acute chalazion in such cases is of the mild passive type, manifesting itself in symptoms which are mainly due to a hypersecretion of the glands. There seems to be a definite relationship between the hypersecretion of the glands in the scalp and the glands of the conjunctiva. Seborrhœa capitis oleosa (oily dandruff) is a common affliction, and to justify a relationship between it and any other pathological state better proof is necessary than their frequent co-existence. However, when one finds that in people who have a tendency to Meibomian infections the liberal application of a fatty substance will very often start an inflammation in a Meibomian gland, and, again, that an inflammation of a Meibomian gland, if seen at an early stage, may be stopped if the scalp is given the proper drying treatment, one is justified in assuming that the relationship is not merely accidental. Vaseline is, in my experience, the most reliable agent for causing trouble; next comes nujol. Cold cream and olive oil were also tried with similar effect, although somewhat less potent. Fatty applications to the eyebrows and eyelids (some even possessing disinfecting qualities, such as yellow oxide of mercury) were tried, and the tendency was the same. *Per contra,* applications which tend to dry the scalp may be expected to do good. The drying of the scalp, as one would expect, is only temporary, but even a short period of a clean dry scalp is, in my opinion, sufficient to stop the progress of the infection in the Meibomian gland and allow it to subside.

There are many methods of temporarily drying a scalp. The simplest, I have found, is to rub into the scalp common table salt, followed by a shampoo with tincture of green soap.

This method of aborting a chalazion is worth trying. People who have had the experience of having one operated upon, only to have another appear shortly after, become very discouraged, since there seems to be no way of preventing their recurrence. Even the earliest treatment does not seem to affect the ultimate formation of a chalazion, once the first signs and symptoms have made their appearance. The local congestion, the feeling of tightness of the eyelid, the increase in the secretion of the conjunctiva, the sharp pain over the inflamed gland are the early signs of trouble, and hot applications only help to make the patient more comfortable and hasten the progress of the acute stage, after which the chalazion is ready to be operated upon.

Clinical and Laboratory Notes

SILVER NET FOR BIG POST-OPERATIVE VENTRAL HERNIAS

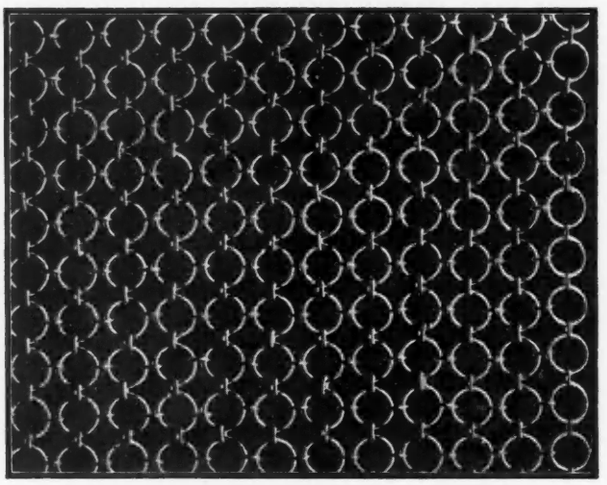
BY N. J. NEUFELD

Winnipeg

In October, 1933, Mrs. W., aged 53 and weighing about 190 lbs., had her first operation for suspension of the uterus. After this operation she developed a post-operative ventral hernia. In 1934 the hernia was repaired. This wound, however, did not heal *per primum;* suppuration set in, lasting 3½ months, while discharge continued for ten months. Due to this suppuration the operation was not a success, and soon a huge post-operative hernia developed, making the patient's life miserable and incapacitating her for work on the farm. Several openings could be found in the middle line where the bowels and omentum came through.

In October, 1936, I first operated on this hernia. Upon exploring the contents of the hernial sac, it was found that large loops of bowels were adherent to the hernial sac, and the whole front of the abdominal wall had a number of larger and smaller openings through which the viscera herniated. It took over an hour to separate the adherent loops of bowels and parts of the omentum from the abdominal wall, to get the fascial border of the incision clear. The fascia was so thin and weak that nearly every stitch would tear out when the attempt was made to bring the widely separated edges together. It was clear to me that this operation could not be of permanent value. A special abdominal support was made for her, but in spite of this she developed a rupture shortly after, caused by sneezing. Since that time the hernial sac became larger, associated with constant pain in the lower abdomen, rendering her incapable of doing her housework.

For this reason I proposed to do a plastic operation to reinforce the abdominal wall after stitching up the fascia. While doing post-graduate work at Leipzig, I saw several operations done with silver net on big ventra hernias. Privatdozent V. Koenig did severa of these operations successfully and in this case I followed his advice for this type of operation. I ordered a silver net from the Electric Chain Co., in Toronto. This net was made of small silver-plated rings (size 0.5 centimeter). These rings were netted together with smaller rings, the whole net being 6 by 7 inches. (See Fig.).



On January 13, 1938, this operation was performed. It was still more difficult to separate the bowel loops from the hernial sac. The two edges of the fascia could only be brought together by great force. For this reason several heavy silk stitches were used; then the silver net was stitched to the fascia and the skin closed with heavy silk stitches. The wound healed up satisfactorily and very little discharge was noticed after. No suppuration followed and in 18 days Mrs. W. was able to leave the hospital. An x-ray was taken 4 months later, which showed the silver net in good position. It is now 1½ years after the operation. There is no recurrence of the hernia and at the present time she is able to take full charge of her household duties. The progress of this case will be reported at a later date.

Angina pectoris should not be given as a cause of death. Pointing out that angina pectoris refers only to symptoms and not to a definite disease entity, Dr. George Dock contends that whenever the term is used "it must be with the conviction that the name refers only to symptoms and demands a prompt and thorough differential diagnosis to exclude all other causes of pain, or to assign them their significance. Its adoption also necessitates an exact and persistent search for evidences of coronary disease and a prompt and intensive plan of treatment to meet all possibilities." The term angina means a disease or symptoms characterized by spasmodic suffocating attacks, and the word pectoris refers to the chest. The author points out that "angina" was used as early as the sixteenth century to designate cases of quinsy or sore throat in which a feeling of strangling and anxiety entered. "Chest pain" was therefore an apt name for the group of symptoms that arrested the attention of William Heberden, who first used the term angina pectoris.—*J. Am. M. Ass.*, 1939, **113:** 563.

Editorials

THE GENESIS OF HEADACHE

HEADACHE, otherwise a painful sensation in the head, may arise from many causes and from many directions. It is one of the commonest of symptoms, so common, indeed, that it seems that by so much it has lost diagnostic significance. A reference to some five or six well-known textbooks of medicine led to the rather surprising discovery that the word "headache" appears in the index of only two, and then in each case with only a single connotation, once in connection with migraine and once with uræmia. One "practical" clinical work, indeed, listed it a number of times but always in connection with some particular disease and without elaboration. One would have thought that somewhere in these texts could be found a helpful dissertation on the nature and significance of headache. Possibly the authors may have felt their limitations and have hesitated to dogmatize on so nebulous and elusive a subject. But studies from the experimental and histological side are now beginning to throw some light upon it.

When the physician is confronted with the symptom of headache he is apt to think of the following as etiological factors, constipation, eye-strain, infectious fevers, toxæmia, uræmia, meningitis, migraine, nasal affections and sinusitis, brain tumour and cerebral arteriosclerosis. It is well to remember that there are other causes. Not all headaches originate within the cranium; many of them are traceable to structures outside of that cavity, to wit, the eyes and co-ordinated muscles, the scalp, and the tissues of the occipital region. In the case of the eyes we first think of "eye-strain"; in the scalp we think of trauma, abscess, inflammation, and tension, in the last-mentioned case as seen in the headache that sometimes follows the doing-up of the hair in an unaccustomed way; in the occipital region, we think of abscess, "rheumatism", so-called, "neuritis", again so-called, fibrositis and myositis; in the cranial bones we think of osteitis and periosteitis of various derivations. None of these conditions calls for detailed consideration now. They are fairly simple. It is the headaches of intracranial origin that constitute the main puzzle.

Some progress in the elucidation of pain occurring within the cranial cavity has been made of late years through the clinical observations of certain neurosurgeons, notably, Lennander,[1] Fay[2] and Penfield,[3] and the experimental work of Pickering.[4,5] It seems now to be generally agreed that the brain and pia-arachnoid are completely insensitive to mechanical injury, except in the Sylvian fissure, where pain is produced by stimulation in the neighbourhood of the vessels. The dura is for the most part also insensitive, except that painful sensations can be elicited by a variety of stimuli applied to the meningeal arteries and their branches and in the neighbourhood of the large venous sinuses. Traction on the falx cerebri or on the tentorium cerebelli also causes pain, it is supposed because of distortion of the venous sinuses where these are attached to the parietal dura mater. Further, the dura mater at the base of the brain and the circle of Willis with its main branches are said to be sensitive, though on somewhat insufficient evidence.

Some observations in 1933-34 by Dr. G. W. Pickering have advanced our knowledge considerably. Using intravenous injections of histamine for the purpose of measuring the circulation time, he noticed that the injections were followed by severe headache in himself and other subjects. Later, he and his associate Dr. Werner Hess were able to show that histamine headache does not arise from the scalp but probably from the meninges. Further, the pain seems to arise from a structure supplied by the fifth nerve, since histamine headache is

1. LENNANDER, K. G.: *Mitt. Grenzgeb. Med. Chir.*, 1906, **15**: 465.
2. FAY, T.: *Arch. Neurol. & Psychiat.*, 1931, **26**: 452.
3. PENFIELD, W.: *Proc. Ass. Res. Nerv. & Ment. Dis.*, 1935, **15**: 399.
4. PICKERING, G. W.: *Clin. Sc.*, 1933-34, **1**: 77.
5. *Idem*: *Brit. M. J.*, 1939, **1**: 907.

usually confined to the normally innervated side in patients who have undergone unilateral trigeminal section. It is currently accepted that the dura mater is the chief meningeal structure innervated by the fifth nerve.

Histamine acts on smooth muscle, which in the case of the cranial cavity means the walls of the blood vessels. Histamine headache may then be due in some way to a vascular change. This explanation was supported by the further experiments of Pickering and Hess and has been confirmed by Clark, Hough and Wolff.[6] Pickering thinks that the course of events following the injection of histamine is probably as follows. "The first phase is one in which dilatation of the small vessels predominates and in which the intracranial arteries, though probably relaxed, are prevented from dilating by the fall of arterial pressure inside and by the rise of intracranial pressure outside. During the second phase the arterial and intracranial pressures return to normal as dilatation of the small vessels subsides, and coincidently the larger intracranial arteries, whose walls are still relaxed, expand; it is this expansion which seems to give rise to headache. Finally, relaxation of the intracranial arteries passes off and headache subsides." The vessels concerned are probably the arteries of the dura mater, though Northfield[7] has produced some evidence to show that it is the branches of the internal carotid artery that are concerned.

The headache following lumbar puncture and pyrexial headache resemble histamine headache in some particulars. The behaviour of the former is quite consistent with the view that it arises from stretching of the dural venous sinuses by a hyperæmic and displaced brain, but further observation is necessary before a final decision can be made. It may be suggested that pyrexial headaches are likewise due to stretching of the sensitive structures around the intracranial arteries, probably from relaxation of these vessels, but what way this is brought about we do not as yet know.

Migraine headaches still remain a puzzle. We do not know, for instance, if the pain is due simply to dilatation of the temporal artery and the arteries of the scalp or whether there is an additional factor in the sensitization of the nerve endings by a chemical agent.

With regard to the headaches that often accompany cerebral tumours there are some points of similarity between them and histamine headaches, but we may also envisage some change in the spatial relation of the brain and dura mater which may bring about tension on the venous channels uniting them.

Mechanical theories as to the causation of meningitic headaches would seem to break down. Probably we have to deal here with a sensitization of the sensory nerve endings due to some chemical substance elaborated during the inflammatory process.

Post-traumatic headaches are due, according to Penfield[8] and Penfield and Norcross,[9] to tension on adhesions which develop between the dura and arachnoid near the site of the injury.

Pickering (*loc. cit.*[5]) concludes that most headaches of intracranial origin are due to tension; and that the regions where tension may produce pain are around the intracranial arteries (as from dilatation), and also possibly around the venous sinuses (as from displacement of the brain or portions of it). There may, however, be other causes of intracranial headache.

Histological studies of recent years have contributed not a little to the further elucidation of the problem of intracranial pain. An important paper of this kind is one by Dr. F. L. McNaughton,[10] of Montreal, who, on the basis of his own studies and a consideration of earlier work, concludes that there is abundant anatomical evidence of a nerve supply to the dural, pial, and intracerebral blood vessels, and to the walls of the dural sinuses. This supply consists of vasomotor fibres derived from the cervical sympathetic trunk, together with fine branches from certain of the cranial nerves. To quote him, "The cranial nerve branches to the dura and the dural vessels and sinuses come mainly from the fifth nerve, with

6. CLARK, D., HOUGH, H. AND WOLFF, H. G.: *Proc. Ass. Res. Nerv. & Ment. Dis.*, 1934, **15**: 417.
7. NORTHFIELD, D. W. C.: *Brain*, 1938, **61**: 133.
8. PENFIELD, W.: *Surg., Gyn. & Obst.*, 1927, **45**: 747.
9. PENFIELD, W. AND NORCROSS, N. C.: *Arch. Neurol. & Psychiat.*, 1936, **36**: 75.
10. MCNAUGHTON, F. L.: *Proc. Ass. Res. Nerv. & Ment. Dis.*, 1937, **18**: 178.

smaller branches from the ninth, tenth, and twelfth nerves. The branches to the pia and to the pial and intracerebral vessels include a parasympathetic branch from the seventh and fine branches from most of the other cranial nerves. These nerves probably contain some sensory fibres for the blood vessel walls and the surrounding meninges." It is conceivable, then, that this sensory mechanism may be set in operation by stimuli coming to it from regions outside the cranial cavity, or from within it as a result of alterations in the calibre of the blood vessels concerned. Anoxia and liberation of toxic substances come into mind here. Further study is necessary to clear up these and other points.

Excellent clinical studies of headache are those of Sir Edmund Spriggs[11] and Professor Cohen.[12] A.G.N.

11. SPRIGGS, SIR E.: *The Lancet*, 1935, **2**: I, 63.
12. COHEN, H.: *Brit. M. J.*, 1939, **2**: 713.

MEDICAL SCIENCE AND SOCIAL PROGRESS

IN the days of "Good Queen Bess", roughly some three hundred and seventy-five years ago, London, the great metropolis, from the public health standpoint, was in a deplorable condition. The first principles of sanitation were then unknown; personal hygiene was almost impossible. The gentlemen cropped their hair and wore wigs, to discourage vermin; the ladies used perfumes freely, to take the place of baths. Water was obtained from pumps and open conduits. Household refuse was thrown out of the windows, much to the disconcertment of the passersby. Fæcal matter was carted to the outskirts, there to rot and harbour flies. Diet was unbalanced, being largely of meat of various kinds, with a minimum of fresh vegetables and fruit. Little wonder, then, that the toll taken by disease, particularly infectious disease, was high. The expectation of life was only about twenty-five years. Gout, calculosis, scurvy, rickets, venereal diseases, typhoid, typhus, tuberculosis, the exanthemata, including smallpox, were rife. Plague, and probably influenza, occurred in epidemic form. What we do wonder at is that a nation so afflicted could have given the world a Shakespeare, a Jonson, a Spenser, and a host of lesser lights; a circumnavigator of the globe, like Drake; a politician like Burleigh; a Francis Bacon, "the Father of Inductive Reasoning"; a traveller and pioneer, like Raleigh. Truly the period of Elizabeth's reign deserves its title of "The Golden Age of England". Of science, however, there was little or none. But early in the seventeenth century appeared Gilbert, who discovered terrestrial magnetism, and Harvey who established the value of experimental physiology. From this time on there was progress in science, but it was slow. It was slower still in sanitary science, and only became notable sometime after the establishment of the "germ theory" of disease. It was, indeed, not until from 1842 to 1862 that an ordered system of sewers came into being in London. During that period 100,000 cesspools were abolished.

How different today! Small-pox, diphtheria, typhoid, typhus, tuberculosis, cholera, syphilis, streptococcal septicæmia, scarlatina, and plague are well under control. Antigens, toxoids, antitoxins, vaccines and antisera are playing their parts here. The discovery of new chemical substances, arsenicals, prontosil, sulfanilamide, sulfapyridine, drugs that are nearly specific, needs only be mentioned. The metabolic diseases are dealt with more successfully since the advent of hormones and vitamins. All this has come about through a better understanding of the causes of disease, mainly as a result of experimental research, and the application of the knowledge so obtained to public health problems. As a consequence a great saving in life, suffering and sorrow has been effected. The expectation of life at this date, 1939, has been placed at 61.5 years. It must however, be confessed with regret that our control of such scourges as the "common cold", poliomyelitis, influenza and cancer leaves much to be desired. There are still fields to conquer.

But this is not all. Apart from governmental agencies such as Ministries and Boards of Health which are concerned with such matters as Notification of Infectious

Disease, Quarantine, Vaccination against Small-pox, Diphtheria and sometimes Typhoid, the Provision and Maintenance of a Pure Water Supply, Pasteurization of Milk, the Inspection of Foods, the Regulation of the Sale of Dangerous Drugs and Cosmetics, Vital Statistics, we have innumerable other bodies, official, semi-official, and independent, which concern themselves with the public weal—hospitals, doctors, and out-patient clinics, of course; child-welfare organizations; pre-natal clinics; maternal welfare organizations; psychoanalysis stations; cancer "campaigns"; bodies which provide free milk for school children; Fresh Air Homes; Children's Camps, and the like. Some progress has also been made in clearing away slums and setting up model villages. Scientific knowledge is being applied in a logical way, and the health of peoples and their mental outlook benefit by it. As an example, Sir Edward Mellanby[1] is authority for the statement that medical science, in addition to its claims on the public's gratitude for its remarkable discoveries, has had also its effect on the quality of life and the general improvement in the physique and health of the population. This is particularly noticeable in the development of boys and girls of school age. In the twenty years, 1911 to 1931, the average height and weight of boys of twelve years of age attending elementary schools at Leeds increased from 4 ft. 4 in, and 63.5 lb. to 4 ft. 7 in. and 74.4 lb., respectively. This observation is corroborated by Sir Henry Bashford in the case of those employed at the Post Office. The present-day boys, aged sixteen, are 16 lb. heavier and 1.5 in. taller than boys of the same age twenty-five years ago; girls of sixteen are 10 lb. heavier on an average and 1 in. taller than girls of the same age in the previous generation. Most or all of these improvements in physique are now known to be due to changes in food habits, particularly in the increased consumption of the protective foods—milk, butter, eggs, fruit and vegetables—and the lessened use of bread and cereals. We may add that rickets, scurvy, glandular tuberculosis, and chlorosis have all but disappeared. Corroborative evidence can also be gleaned from the experience of recruiting officers in Britain at the onset of the present war. Of 20,000 men aged 20 to 21 no less than 84.5 per cent were classed as grade A, that is, completely fit; another 9 per cent were classed as fit except for minor disabilities such as would not impede their training; 4 per cent had disabilities such as defective vision and bad feet, but yet might find a place in the new army; only 2.3 per cent were definitely unfit for military training. This is highly gratifying. The Minister of Health, the Hon. Walter Elliot, believes that these results are a striking tribute to the improved social services that have been operative since the last war. But this is not all. These young men, born in 1918 and 1919 have not benefited from these services as much as will their successors, for the great developments of pre-natal clinics and extra feeding at schools, to mention only two, have taken place since their day, while the campaign against slums is only some six years old. We may expect, therefore, a progressive improvement in the health of the people in proportion as the teachings of medical science are popularized and are made effective by regulation.

Unfortunately in the past there has been at times a lag between the demonstration of scientific truths and the utilization of such knowledge for the public weal. This was notably so in the case of the bacterial origin of certain diseases when it took about ten years to put into operation in the United States measures of inoculation with vaccines, toxins and antitoxins in the prevention and treatment of infectious diseases. The reasons for this are well-known and need not be detailed. Perhaps the most important factor may be mentioned, however—the state of public opinion. There are evidences that the people at large are becoming health-conscious. The newspapers are featuring more and more medical and public health items, not always dependable, it is true, but having a certain news value and therefore tending to excite interest in such matters. We find, also, on account of the growing cost of medical care, that various projects for health insurance are becoming increasingly popular. It would seem probable then, that our progress in the establishment of public health measures in the future will

1. Recent Advances in Medical Science: The Rede Lecture, 1939, Cambridge University Press.

not be conditioned by the apathy or opposition of the public but chiefly by the amount of money available for the purpose.

Another indication of the change that has come over the public mind is seen in that whereas fifty years ago you could hardly persuade a patient to enter a hospital, for he regarded this as practically signing his death warrant; now you can hardly keep him out. This is sometimes hard on the hospitals and the doctors, for they are apt to be exploited by those who can and should pay. And, nowadays, hospital and medical care comes high. This is unavoidable because of the increased amount of equipment necessitated by the great advances in medical science. And somebody must pay for these. However there is another side to this. As the health of the people generally improves the tax on the hospitals will become less and their expansion will cease. Possibly in time they will come to be institutions for observation and examination rather than for treatment—in short, their rôle will be prevention.

The doctors, too, at least those engaged in general practice, will possibly find themselves linked up with public health departments and that their duties also have to do with prevention rather than with treatment. We are sure, at all events, that a great change is taking place in our handling of disease with a consequent readjustment in the relations of doctor and patient. We may hope that, though the readjustment may be painful in some ways for the time being, the final result will be for the benefit of all.

A.G.N.

Editorial Comments

Potassium Chlorate—A New Cure for Poliomyelitis

We are familiar with the situation when a clinical man, often of reputable position, gets an idea which he thinks is promising; he proceeds to test it, using controls, but without due consideration of all the attending circumstances; he becomes obsessed with his subject and comes to conclusions that are erroneous or at best over-optimistic. If the subject of his studies has some public interest the lay press seizes upon it and puts forth claims that are entirely misleading. Such is the history of a new cure for poliomyelitis—potassium chlorate. Accepting that potassium chlorate is a specific for this dread disease, it is a well-known substance, cheap, and can be obtained at any drug store, so why not cure yourself? The danger attending such publicity is obvious.

Dr. C. Contat, writing in the *Schweitzer Medizinische Wochenschrift*, noted that when he had used potassium chlorate for the relief of a sore throat occurring in a case of acute poliomyelitis the progress of the case was favourably influenced. Starting from this somewhat nebulous premise, he, with certain associates, instituted a number of experiments on monkeys which seemed to give striking confirmation of his clinical impression. Then came the publicity.

The matter was of such great importance that it was deemed well to repeat Contat's work, using his technique so far as this was possible. Accordingly, Drs. Jean Saucier and Oscar W. Stewart, working at the Montreal Neurological Institute, took up the study and their work is detailed in this issue of the *Journal* (see p. 19). Their results contradict those of Contat and his associates, and they conclude that potassium chlorate is of no value in controlling the development or course of experimental poliomyelitis in monkeys. In view of the likeness of this disease in monkeys to the same disease in mankind it seems a reasonable conclusion also that potassium chlorate is of no value in the treatment of the human subject. It should be remembered, too, that potassium chlorate is not by any means innocuous. We would call attention here to an article in this issue of the *Journal* which reports a fatal case of poisoning by potassium chlorate (see p. 23).

A.G.N.

The Nutrition of the Army

It is recognized that an army fights on its stomach, and in the last war the Army Service Corps had reason to be proud of their part in keeping that stomach unfailingly supplied. In the present war, however, the question is not only how the men are to be supplied but what they are to be fed with. In the past twenty-five years the science of nutrition has come into being and is making its voice heard. This is reflected in a recent memorandum from our Association's Committee on Nutrition to the Canadian Medical Advisory Committee, in which it is questioned whether the accepted military rations are as well balanced as they should be. The comment is made that the present ration is low in some of the essential food elements: to quote.

"The present ration does not furnish in adequate quantities many foods that are most desirable, not only from the standpoint of their nutritional values

but from the standpoint of palatability of the ration. For example, milk is our most valuable single food. . . Records from the feeding of the men of the Royal Air Force in Canada during the last war show that when given all the milk they wanted they consumed a quart of milk per day. At the present time the men stationed at Exhibition Park, Toronto, are buying out of their own funds an average of 350 pints of milk per day per battalion, over and above that supplied in the ration. From the standpoint of food preparation, milk is invaluable to make other food dishes more attractive and more palatable.

"Again, fresh fruits and vegetables are desirable from the nutritional, palatability and economic standpoints. At the present time there is an excess of Canadian apples available, which can be used not only in the raw state but in the form of apple sauce or baked apples, yet the ration specifies prunes and raisins, which are not produced in Canada in any considerable quantity. The present fresh vegetable allowance of 6 ounces as purchased will, after preparation and cooking, produce only a small serving once a day."

The memorandum then deals with the great importance of proper preparation of the food, for the finest food in the world can be completely ruined by poor cooking. One has often admired the work of army cooks in the field, but that is not to say that they might not be better trained in the art of making the food palatable. The cook also has a great responsibility in controlling large and valuable supplies and preventing waste.

The conclusion is that we should apply our new knowledge of nutrition to the feeding of our troops; the present rations can readily be altered to meet the requirements. Emphasis is laid on the necessity to see that the food arrives at the depots with the nutritional value unimpaired, also on its preparation by cooks trained to serve it in an attractive and palatable form, without loss of its essential food elements. It is stated that preliminary surveys indicate that this can be done at no increase in cost over the present system.

The consequent recommendation is made that an authority be set up to see that effect is given to the various points in the memorandum to ensure the best possible feeding of the armed forces of Canada. This memorandum has been discussed with the Honourable the Minister of National Defence who asked for a nomination from the Committee for such an authority. The Committee has recommended Dr. F. F. Tisdall, who is willing to undertake the duty on a voluntary basis. It may be added that General Ashton has stated his willingness to co-operate in the matter, and he reports that certain changes have already been made in army rations in co-operation with the Quartermaster General's Department. H.E.M.

The New Cancer Centre in Regina

Saskatchewan is to be congratulated (and at the same time envied) on its enterprise in completing a building in connection with the Grey Nuns' Hospital, Regina, designed solely for the diagnosis and treatment of cancer. The erection of this building marks a tremendous step forward in the treatment of this disease in Saskatchewan and western Canada and is of historical importance in as much as it is the first building to be erected in Canada, designed and equipped for this purpose only. The credit for this progressive step goes to the Hon. J. M. Uhrich, M.D., Minister of Public Health, and the members of the Saskatchewan Cancer Commission, Dr. R. O. Davison, Deputy Minister of Public Health (Chairman), Dr. David Low and Dr. Laurent Roy, as well as to the vision of the Grey Nuns' Order. Much credit must also be given to the Cancer Committee of the Saskatchewan College of Physicians and Surgeons, under the chairmanship of Dr. E. B. Alport, who for the past ten years have advocated the centralization of cancer patients in order that modern advances in the diagnosis and treatment of this disease be made available for the people of the province.

An adequate supply of radium, the latest in high voltage x-ray equipment, efficient, compact, surgical examining and diagnostic facilities make it one of the foremost centres in Canada for this type of work.

A fuller account of this building can be found elsewhere in the *Journal* (see p. 85). We hope that Saskatchewan's splendid lead in this important matter will be followed by the other provinces of the Dominion.

A newly discovered factor in the tuberculosis death rate which has been continuing over a long period of years has been brought to light by Miss Jean Downes, of the Milbank Memorial Fund. This factor, it appears, will in the future continue to play an increasingly important part in the continued decline in tuberculosis mortality. The new factor has to do with the effect of tuberculosis on the size of the family unit. The family unit in her studies consisted of mother, father and children. When one of the parents had tuberculosis, the family had fewer children than non-tuberculous families did. The tuberculous family's size was further reduced by earlier deaths of its members. This tendency of the tuberculous family to be eliminated more rapidly, through the combination of lower fertility and excessively high mortality of offspring, has contributed to the decline in the tuberculosis death rate. Since limitation of births among the tuberculous is now being encouraged as a health measure for the tuberculous, if in the future there is no marked change in the hazard of death and disease to the offspring of the tuberculous, the size of the family unit among the tuberculous will play an increasingly important part in decline in mortality from this disease. These conclusions were drawn from a study of family histories in a rural area of Cattaraugus County, N.Y. There was about the same difference in average size of families between tuberculous and the group as a whole in both the nineteenth and twentieth centuries. Among families in which all children were born before 1901, for example, at the end of 25 years of married life 100 women in tuberculous families had borne on an average 481 children compared with an average of 526 children per 100 women in the general group of families. During the period from 1900 to 1929, after 16 years of married life, 100 women in the tuberculous families had had on an average 261 children compared with 375 for the 100 unselected women.—*Science News Letter*, September 9, 1939.

Medical Economics

III.

FURTHER INTERPRETATIONS OF THE ECONOMIC TASK OF THE MEDICAL PROFESSION

By Hugh H. Wolfenden, F.I.A., F.A.S., F.S.S.

Consulting Actuary and Statistician
Adviser on Medical Economics to the Canadian Medical Association

The preceding article of this series gave some attention to the importance of the preventive services as an essential part of the economic task of the medical profession, which earlier had been defined as "the development and provision of the best possible health services—both preventive and curative—for all the people, at a price which is fair to all the people, including those who render the services." We may now consider, from an economic standpoint, the implications of the other portions of this definition, namely, (*a*) the "best possible health services", (*b*) "for all the people", and (*c*) the "price which is fair to all the people".

(*a*) The "Best Possible" Health Services

Readers of the previous article will remember that this phrase—the "best possible" health services—was adopted for the specific purpose of embracing the preventive as well as the therapeutic services, and for that reason was suggested as an improvement on the expression "adequate medical care". Following their usual interpretation the words "adequate medical care" would imply, ordinarily, that the medical care to be so given would be based upon an informed and reasonable utilization of modern medical knowledge; the "best possible health services—both preventive and curative" likewise would suggest the use of the best of such services which it would be practicable to obtain. Emphasis here evidently must be laid, however, upon the "practicable" nature of the services, for in many cases it may not be possible to secure all the aids which have become available through the wide discoveries of present-day medicine. The "best possible health services", accordingly, must be envisaged as the best services which can be obtained for an individual under the particular environments of that individual, his physicians, and others who may be called upon to render services, all of whom belong to some community with special characteristics, with certain probable advantages, and doubtless with other disadvantages. The provision of such services, in other words, always will retain an essentially local character, and can be undertaken only with due regard to the available and attainable facilities. The economic questions, therefore, will hardly yield to practical solution unless they are approached with a clear recognition of the local conditions under which they have arisen. Utopian theories must be restrained and brought into some reasonable conformity with the practicalities. The uniformities of too extensive or too rigid "planning" inevitably will contain measures leading ultimately to their own defeat.

(*b*) "For All the People"

The task of providing the best possible health services which thus can be obtained under the particular local environment of the individual assumes a very wide form when consideration is given to the problem in respect of "all the people". For the questions to be faced, and the means available for their solution, differ sharply according to each person's social-economic status. Numerous discussions, and a great amount of consequent legislation in many different countries, have been formulated on the supposition that the whole problem breaks down naturally into that of dealing separately with six main groups, namely, (i) the unemployed without means; (ii) the unemployed with small independent incomes (from investments, pensions, etc.); (iii) the employed with inadequate or low incomes; (iv) the employed and unemployed with modest incomes up to perhaps $1,800, $2,000, or $2,400 per annum; (v) the upper middle class, both employed and independent, with incomes above the $1,800, $2,000, or $2,400 level, but below about $4,000 or $5,000 per annum; and (vi) all those with incomes above the preceding $4,000 or $5,000 per annum.

The careful examination of any such classification is important—for much of the thinking which has been translated into legislation has ignored several of the vitally significant factors. Very often, for example, the broader aspects of the question are dismissed in the tacit belief that some type of "health insurance", for the employed persons only in groups (iii) and (iv), will deal sufficiently with the whole problem. The inadequacy of such a partial solution will be evident at once, however, when it is noticed that it leaves out of account all the other groups, and usually even fails to touch those of group (iv) immediately they cease to be "employees" with some arbitrarily specified earning power. The limitations of "health insurance" of that character will be discussed more fully in a later article; at this point it will suffice to draw attention to the desirability of realizing that the provision of "the best possible health services for all the people" certainly will not be accomplished by any blind adherence to the creed—so strenuously advocated in certain quarters—that "health insurance" for the employed persons of groups (iii) and (iv) must be the one evident and sufficient procedure, to be adopted without further thought. In the later articles, moreover, consideration will be given to the sharply different problems which are presented

by each of the groups from (i) to (vi), together with observations on their possible methods of approach in the light of experiences in Canada and other countries, and the particular social-economic environments of the various geographical divisions of the Canadian people.

(c) "THE PRICE WHICH IS FAIR TO ALL THE PEOPLE"

At this stage of the discussion only a few general comments will be made on the fundamentally important economic question concerning "the price which is fair" to all the people. From what has been said earlier it will be apparent, of course, that a price which is "fair" for one group may be not "fair"—in the sense that it will be outside the range of reasonable possibility—for another group. Furthermore, while a price may be not "fair" for some low-income group by reason of the difficulty of its being paid, it should perhaps be emphasized that a different (probably a higher) price may likewise seem not "fair" to a person in groups (iv) to (vi) even though its payment may be comparatively easy.

These almost platitudinous remarks are included here simply because the medical profession has been attacked repeatedly on the ground that the variations in its scales of charges, in an attempt to make allowance for the economic status of the patient, are—so it is said—improper and unjustifiable. Anyone, however, who once stops to review the history of medical economics will appreciate very quickly that what in fact has happened is that an ancient system of community assistance, rendered by the general practitioner of bygone days, has gradually been modified—perhaps even unconsciously has been impaired—by the progress of medical knowledge and the increasing complexities of our economic world, which have shifted the emphasis from that of a community effort to the specialization and mechanized technique of modern semi-urban practice. The doctor of some years ago, taking his place as a servant to the community, devoted to its needs, and loved and trusted in his turn, gave of his advice and help without hesitation and without restriction—receiving his rewards on the basis of a personal understanding of his patient's economic status, and knowing well that almost invariably the trust imposed in him could thereby hardly ever be in jeopardy. Now, however, so very much of all that personal relationship is changed; particularly is it changed by the growing insistence of the social reformer upon the necessity for "economic planning" on a level of uniformity wherein little room would be preserved for the highly personal relationship between the doctor and his patient. The sliding scale of payment, fitted roughly—arbitrarily and indefensibly, the critics say—to a patient's means, is with us still, though modified and sometimes less understandingly applied in the midst of the pressures of today. With his whole training based—as it should and must be based—on a tradition, the medical practitioner strives to preserve that confidential relationship between his patients and himself which the appreciative patient is the first to defend, but which, perhaps unwittingly, may be undermined by too impersonal a form of economic planning. Much more than is sometimes understood we are witnessing a conflict of ideals, automatically bringing the economic question to the fore. Some agreement as to a "fair" price will be reached only when it becomes clear which of the viewpoints will prevail.

In the meantime, for the purpose of these articles, and with the conviction that the soundest traditions of the medical profession must be preserved if the best possible health services are to be secured, this discussion will proceed on the assumption that the "fairness" of a price may be determinable to some extent in relation to ability to pay, but that our thinking on the subject should not exclude from consideration any of the classes previously named from (i) to (vi). The problem, that is to say, will be examined from the standpoint of providing services to the rich as well as to the relatively poor, so that no group should have any reason for attacking the profession on the ground that its charges are unfair.

One other point should be included here. A plan designed to ease the economic burden of the costs of sickness for the lower earning groups may result in focussing attention at the same time upon the higher charges levied on the higher income groups. If, accordingly, the profession should depart from its time-honoured custom of charging to some extent according to ability to pay, and should endorse some plan of uniform payments for the lower income groups, it is conceivable that it may have to be prepared likewise to entertain a greater measure of control over its fees in the higher income ranges. Ultimately it may be for the profession to decide whether it prefers assistance in the lower income field, or still a free hand in the upper groups—for the modern economic planner, bent on uniformity, may not be disposed to concede its right to the most advantageous position with respect to both.

THE SUBJECTS TO BE CONSIDERED NEXT

These first three articles have attempted to set out in general terms the scope and meaning of medical economics, and the necessary interpretations of the economic task of the medical profession. The main object has been to picture the background of those economic factors which should be borne in mind in the appraisal of specific schemes. The next article, therefore, will deal with the more concrete problems which must be defined in connection with plans of "insurance" and "state medicine". The ground will then have been laid for an examination of the many schemes, both in Canada and abroad, which aim to introduce some greater regularization into the system of payment for medical services.

The Platform of the American Association for Health and Medical Care

A platform for the American Medical Association has been set up as a guide to indicate the trend which the Association believes should be followed in the development of health activities and medical care for the people of the United States.

The Association advocates:

"1. The establishment of an agency of federal government under which shall be co-ordinated and administered all medical and health functions of the federal government exclusive of those of the Army and Navy.

"Today the medical and health functions of the United States are divided among a multiplicity of departments, bureaus and federal agencies. Thus, the United States Public Health Service is in the Federal Security Agency; the Children's Bureau in the Department of Labour; the Food and Drug Administration in the Department of Agriculture; the Veterans' Administration and many other medical functions are separate bureaus of the government. The WPA, CCC and PWA are concerned with a similarity of efforts in the field of preventive medicine. The Federal Works Administration and the Federal Housing Administration also have some medical functions.

"Since 1875 the American Medical Association has urged the establishment of a single agency in the federal government under which all such functions could be correlated in the interest of efficiency, the avoidance of duplication and a saving of vast sums of money. Such a federal health agency, with a secretary in the cabinet, or a commission of five or seven members, including competent physicians, would be able to administer the medical and health affairs of the government with far more efficiency than is now done.

"2. The allotment of such funds as the Congress may make available to any state in actual need for the prevention of disease, the promotion of health and the care of the sick on proof of such need.

"The physicians of the United States have given freely of their time and of their funds for the care of the sick. Their contributions to free medical service amount to at least $1,000,000 a day. The physicians of this country have urged that every person needing medical care be provided with such care. They have urged also the allotment of funds for campaigns against maternal mortality, against venereal disease and for the investigation and control of cancer. The medical profession does not oppose appropriations by Congress of funds for medical purposes. It feels however that, in many instances, states have sought aid and appropriations for such functions without any actual need on the part of the state, in order to secure such federal funds as might be available. It has also been impossible, under present techniques, to meet actual needs which might exist in certain states with low per capita incomes, with needs far beyond those of wealthier states, in which vast sums are spent.

"It is proposed here simply that Congress make available such funds as can be made available for health purposes; that these funds be administered by the federal health agency, mentioned in the first plank of this platform, and that the funds be allotted on proof of actual need to the federal health agency, when that need be for the prevention of disease, for the promotion of health, or for the care of the sick.

"3. The principle that the care of the public health and the provision of medical service to the sick is primarily a local responsibility.

"Obviously, if federal funds are made available to the individual states for the purposes mentioned in the second plank of this platform there might well be a lessened tendency in many communities to devote the community's funds for the purpose and, in effect, to demand that the federal government take over the problem of the care of the sick. Hence it is suggested that communities do their utmost to meet such needs with funds locally available before bringing their need to the federal health agency, and that the federal health agency determine whether or not the community has done its utmost to meet such need before allotting federal funds for the purpose.

"4. The development of a mechanism for meeting the needs of expansion of preventive medical services with local determination of needs and local control of administration.

"The medical profession is not static. It wishes to extend preventive medical service to all the people within the funds available for such a purpose. Obviously, this will require not only a federal health agency which may make suggestions and initiate plans, but also a mechanism in each community for the actual expansion of preventive medical service and for the proper expenditure of funds developed both locally and federally. In the development of new legislation such mechanism may be suitably outlined.

"5. The extension of medical care for the indigent and the medically indigent with local determination of needs and local control of administration.

"The medical profession does not yield to any other group in this country in its desire to extend medical care to all those unable to provide themselves with medical service. The American Medical Association through its House of Delegates has already recognized the possible existence of a small group of persons able to provide themselves with the necessities of life commonly recognized as standard in their own communities but not capable of meeting a medical emergency. It is recognized, however, that only persons of

the same community fully familiar with the circumstances can determine the number of people who come properly under such classification, and that only persons in actual contact with such instances are capable of administering suitably and efficiently the medical care that may be required. Hence it is the platform of the American Medical Association that medical care be provided for the indigent and the medically indigent in every community but that local funds be first utilized and that local agencies determine the nature of the need and control the expenditure of such funds as may be developed either in the community or by the federal government.

"6. In the extension of medical services to all the people, the utmost utilization of qualified medical and hospital facilities already established.

"In the so-called National Health Program it is asserted that one-half the counties of the United States are without suitable hospitals, and vast sums are requested for the building of new hospitals. In contrast, reputable agencies within the medical profession assert that there are only thirteen counties more than 30 miles removed from a suitable hospital and that in eight of those thirteen counties there are five persons per square mile. In the United States today the percentage of hospital beds per thousand of population is higher than that of any other country in the world. This fact is completely ignored by those who would indulge in a program for the building of great numbers of new hospitals.

"Moreover, it seems to be taken for granted that hospital building has languished in recent years, whereas considerable numbers of hospitals have been built with federal funds by various state agencies and also by the PWA, and WPA and the Federal Works Administration.

"Analyses may indicate that in many instances such hospitals were built without adequate study as to the need which existed or as to the possible efficient functioning once they were erected. Moreover, there is evidence that in recent years many of the hospitals of the United States known as non-profit voluntary hospitals have had a considerable lack of occupancy, owing no doubt to the financial situation in considerable part. It seems logical to suggest then that such federal funds as may be available be utilized in providing the needy sick with hospitalization in these well established institutions before any attempt is made to indulge in a vast building program with new hospitals. In this point of view the American College of Surgeons, the American Hospital Association, the Catholic Hospital Association, the Protestant Hospital Association and practically every other interested voluntary body agree.

"Again, it has been argued that the demands for medical care in some sections of the country might require the importation of considerable numbers of physicians or the transportation of numbers of physicians in the areas in which they now are to other areas. In this connection it would seem to be obvious that a change in the economic status of the communities concerned would result promptly in the presence of physicians who might be seeking locations. The utilization of existing qualified facilities would be far more economical than any attempt to develop new facilities.

"7. The continued development of the private practice of medicine, subject to such changes as may be necessary to maintain the quality of medical services and to increase their availability.

"In the United States today our sickness and death rates are lower than those of any other great country in the world. This fact was recognized by the President of the United States when he sent the National Health Program to the Congress for careful study. The President emphasized that a low death rate may not mean much to a man who happens to be dying at the time of tuberculosis. The medical profession recognizes the importance of doing everything possible to prevent every unnecessary death. At the same time it has not been established by any available evidence that a change in the system of medical practice which would substitute salaried government doctors for the private practitioner or which would make the private practitioner subject to the control of public officials would in any way lower sickness and death rates.

"There exists, of course, the fact that some persons are unable to obtain medical service in the circumstances in which they live, and that others, surrounded by good facilities, do not have the funds available to secure such services. Obviously, here again, there is the question of economics as the basis of the difficulty, and perhaps lack of organization in distribution of medical service and a failure to utilize new methods for the distribution of costs which might improve the situation.

"The medical profession has approved prepayment plans to cover the costs of hospitalization and also prepayment plans on a cash indemnity basis for meeting the costs of medical care. It continues, however, to feel that the development of the private practice of medicine which has taken place in this country has led to higher standards of medical practice and of medical service than are elsewhere available and that the maintenance of the quality of the service is fundamental in any health program.

"8. Expansion of public health and medical services consistent with the American system of democracy.

"Careful study of the history of the development of medical care in various nations of the world leads to the inevitable conclusion that the introduction of methods such as compulsory

sickness insurance, state medicine, and similar techniques results in a trend toward communism or totalitarianism and away from democracy as the established form of government. The intensification of dependence of the individual on the state for the provision of the necessities of life tends to make the individual more and more the creature of the state rather than to make the state the servant of the citizen. Great leaders of American thought have repeatedly emphasized the fact that liberty is too great a price to pay for security. George Washington said 'He who seeks security through surrender of liberty loses both.' Benjamin Franklin said 'They that can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety.'

"In these times, when the maintenance of the American democracy seems to be the most important objective for all the people of this country the people may well consider whether some of the plans and programs that have been offered for changing the nature of medical service are not in effect the first step toward an abandonment of the self-reliance, free-will and personal responsibility that must be the basis of a democratic system of government."—Reprinted from the *J. Am. M. Ass.*, 1939, **113:** 1966.

Retrospect

TYPHOID FEVER IN THE 1890's AND THE 1930's

BY JONATHAN C. MEAKINS

Montreal

The prevalence of typhoid fever may be taken, I think, as a fairly accurate index of the efficiency of the public health administration of a community. If this be accepted it must be granted that the public health of the latter part of the nineteenth century was indeed deplorable. The sanitary history of Munich from 1851 to 1896 supports this contention. Osler records in the first edition of his textbook that the annual death rate per hundred thousand from this disease in 1851 to 1860 was 202, while in 1891 to 1896 it was 5.6. Many of the metropolitan areas of North America in the latter period compared unfavourably with Munich in the 1850's, terrible though this may have been. Today the picture is entirely changed and typhoid fever has practically disappeared, and will eventually be taught by the Professor of the History of Medicine rather than by the Professor of Clinical Medicine. A truly great triumph for preventive medicine! A tribute must also be paid to Almroth Wright, who first championed preventive inoculation against the typhoid bacillus.

Little has been added in the last forty-five years to the description of the disease, or to its diagnosis since 1896, when Widal first made practical application of the work of Gruber and Durham on the specific immunological entity of agglutinins. It is true that our methods of blood, stool and urine cultures have improved, but this is a refinement of detail rather than of principle.

The mortality of typhoid fever has progressively declined — not steadily, but rather by abrupt stages as fresh concepts of pathology and nutritional requirements have been put into practice. On reading Osler's account of typhoid fever one is impressed amongst other things by his accurate description of the disease. Whereas in his description of fourteen of the diseases classified under "Specific Infectious Diseases" he has a heading called "Complications", in all the rest of this group no such heading is found. It is true that some of these diseases were of little importance perhaps; but, epidemics of relapsing fever, influenza, yellow fever and plague, to mention but a few, were, to say the least, causes of great mortality. It might be that in the diseases in which "complications" are not mentioned under a separate heading Sir William did not consider them of sufficient importance. This, however, could not have been the case with typhoid fever. He uses in this instance a heading which I cannot find mentioned in the description of any other disease. It is "Special Features and Symptoms". This section begins with "Mode of Onset" and terminates with lesions in the muscles. Through this section the word "complications" is used fourteen times and refers to the following—pericarditis, arterial thrombosis, venous thrombosis, hæmorrhage, cholecystitis, laryngeal complications, lobar pneumonia, hemiplegia, tetany, optic neuritis, pyuria, acute mastitis and arthritis. It is interesting to note that intestinal perforation is not so described. To speculate as to whether Osler did this with intent would be futile, but he was a close student of this disease, as is well demonstrated by the prominence he gives it in his textbook, both as to position and number of pages, for it is only exceeded in the latter respect by tuberculosis, syphilis and pneumonia, poor competitors. His many papers (70 references in his bibliography) on typhoid fever, and the importance he gave to it in his clinics also conspire to emphasize this.

It is from amongst these "Special Features and Symptoms" that I believe there can be demonstrated a different conception of this disease and its course today compared with that of

* Read at the Seventieth Annual Meeting of the Canadian Medical Association, Osler Hour, Montreal, June 23, 1939.

forty years ago. I also believe that Osler did not emphasize these features as complications of the disease because he was not sure of their cause or origin. The neglect to designate perforation as a complication was undoubtedly a slip, although it is not so referred to in any of the later editions.

Before I proceed with more detailed considerations I wish to refer briefly to the treatment in vogue at the time, as outlined in his earlier editions.

> *Diet.*—Small residue; milk at least 3 pints a day diluted with water. Curds in stools indicate substitution of mutton or chicken broth, beef juice, clear consommé, and fresh vegetable juices, thin barley gruel, whey, buttermilk, kumyss, or matzoon; albumen water; whole egg occasionally; no fruit, although lemon or orange juice may be given.

"It is possible that we give too much food. Inglis has shown that cases can do very well on cold water alone. The outcry against milk in some quarters is, I am sure, unfounded, ... , and when alternated with egg-albumen forms the ideal diet for typhoid patients alone."

> *Hydrotherapy.* — Fluids were usually restricted to about 1,500 c.c. a day. If compared with later use of fluids when 6 to 7 litres were the daily allowance, this was a moderate amount. Intravenous and subcutaneous administration of fluids was not used to relieve dehydration, but saline infusions were advocated for "heart weakness"; in other words, for circulatory collapse after the event.
>
> *Medicinal.*—Antipyretics. "They are used far too often and too rashly in typhoid fever. . . ."

I wish to draw your attention particularly to the character of the diet. In the first place the caloric value, about 1,200 calories a day, was seldom over and often much less than this and was frequently continued over many weeks and well along into convalescence. The emaciation and malnutrition were extreme. But, in addition, the practical absence of vitamins and iron was of even greater importance. It is true that a moderate amount of vitamin A was contained in the milk but all the other vitamins were greatly deficient, except for what would be present in the occasional egg.

I shall now deal with the "Special Features and Symptoms", many of which may, I think, be attributed more to the therapy than to the infection itself. For convenience these may be grouped into three categories:

1	*2*	*3*
Cachexia	Tender toes	Noma
Œdema	Local neuritis	(granulo-
Anæmia	General neuritis	cytopenia)
Dry tongue	Acute ascending	Skin gangrene
	paralysis	Symmetrical peri-
	(beri-beri)	pheral gangrene
	Sub-acute paralysis	
	Insanity	

There is little doubt in my mind that most of these were not due to the disease *per se* but were the result of grave dietetic deficiencies. The present day knowledge of metabolism and nutrition did not exist then and the whole treatment was based on a desire to avoid anatomical accidents; hence therapeutic pessimism and nihilism!

1. The cachexia and œdema were undoubtedly due to a common cause, namely, protein and fat deficiency; anæmia to iron deficiency; and dry tongue to dehydration.

2. The paralyses, tender toes, and insanity are strongly suggestive of beri-beri and vitamin B deficiency. It is interesting to note that they occurred late in the disease or in convalescence.

3. Noma and other forms of gangrene not due to arterial thrombosis — could these have been the result of granulocytopenia? Could drugs have been the cause of accentuating an already existing leucopenia? Within recent months I have seen a case of granulocytopenia, angina and typhoid fever. The presence of both conditions was recognized during life and proved at autopsy.

With the present high caloric and rich vitamin diet few of these "Special features and symptoms" are now encountered. There is little doubt that the modern concept of nutrition has done much to rob this now comparatively rare disease of many of its terrors. But the moral is still there! In our enthusiasm for one therapeutic conception or regimen let us be certain that we are not "robbing Peter to pay Paul".

Association Notes

Medical Military News

In the last issue of the *Journal* we published an account of the progress which had been made to date in respect to the Association's relationship to the Government in medical military affairs. Here is a further progress report.

Questionnaires

The following is a report by provinces with respect to returned questionnaires.

British Columbia	689
Alberta	425
Saskatchewan	545
Manitoba	589
Ontario	3856
Quebec	1608
New Brunswick	261
Nova Scotia	362
Prince Edward Island	40
Total	8375

A return of 8,375 questionnaires represents a response of more than 83 per cent, as approximately 10,000 were sent out. This is indeed

remarkable and a very splendid tribute to the medical profession of Canada. Among other things, it demonstrates what a high percentage of the profession have accepted the opportunity afforded by the questionnaire of putting themselves on record as to where they stand or what they can do in respect to the present war. The task of classifying and coding the information is an arduous one. Progress is being made in this direction, and it is hoped in the very near future to be able to report a breakdown of the returns.

CONTACT MEN

Divisional Advisory Committees have now been established in all the Military Districts, and in each Committee one member has been named Contact Man to the D.M.O. of the District. For the information of all concerned, we present hereunder the names of the contact men of the various Military Districts. Consult the contact man in your District about any matters which you wish to bring to the attention of the local or central committees.

Military District No. 1 (Ontario South and West)
Dr. G. A. Ramsay, London
Military District No. 2 (Ontario Centre, North and South)
Dr. A. D. Kelly, Toronto
Military District No. 3 (Ontario East, including small portion of Quebec)
Dr. F. Etherington, Kingston
Military District No. 4 (Quebec West)
Dr. F. S. Patch, Montreal
Military District No. 5 (Quebec East)
Dr. Jas. Stevenson, Quebec
Military District No. 6 (Nova Scotia and Prince Edward Island)
Dr. J. R. Corston, Halifax
Military District No. 7 (New Brunswick)
Dr. R. M. Pendrigh, Saint John
Military District No. 10 (Manitoba, including Keewatin, Kenora, Rainy River, Thunder Bay)
Dr. W. E. Campbell, Winnipeg
Military District No. 11 (British Columbia and Yukon)
Dr. Thos. McPherson, Victoria
Military District No. 12 (Saskatchewan)
Dr. A. W. Argue, Grenfell
Military District No. 13 (Alberta and Mackenzie District)
Dr. A. E. Archer, Lamont
Deputies—Drs. Geo. R. Johnson, Calgary, and A. W. Macbeth, Edmonton.

PART-TIME SPECIALISTS

There are a number of doctors in the different specialties in Canada who are key men in their positions and who might be used for part time military work in certain places. It would be wasteful to employ full-time specialists where part-time men would serve just as well. The Canadian Medical Advisory Committee crystallized its views with regard to this matter in the following resolution:

> That this Committee approves of the principle of part-time employment in Canada by the Department of National Defence, of medical specialists engaged in a civilian capacity and remunerated in accordance with their ability and the amount of service rendered.

SELECTION AND PAY OF MEDICAL OFFICERS

Your Canadian Medical Advisory Committee, in the following resolution, sets forth its views with regard to the selection and pay of medical officers:

> That, in the selection of medical officers for the Canadian Army Service Forces, medical qualifications should be the prime consideration; and that officers holding posts in charge of medicine or surgery in hospital units of the C.A.S.F. should have the rank of Lieutenant-Colonel from the date of their appointment to these posts.

PROTECTION OF POSITIONS AND APPOINTMENTS

Attention is called to the fact that, as far as possible, medical men who enlist should be protected at home as far as their positions and appointments are concerned. The Canadian Medical Advisory Committee, in the following resolution, makes a pronouncement upon this important matter:

> That in the opinion of this Canadian Medical Advisory Committee every effort should be made to protect official appointments and positions vacated by doctors enlisting for military service; and that, where such positions have to be filled, it be done on a temporary basis; and that every effort be made, upon the return to civilian life of the officers concerned, to reinstate them in their former positions; and that copies of this resolution be forwarded to each of the nine Divisions with the request that the resolution be publicized in the most effective manner.

PROTECTION OF PRIVATE PRACTICES

It has been brought to the attention of the Canadian Medical Advisory Committee that some effort should be made to protect the private practices of doctors enlisting for service. The following resolution was passed:

> That, whereas it has been recommended to this Committee that steps should be taken to protect the private practices of doctors enlisting for military service; and whereas this Canadian Medical Advisory Committee believes that every legitimate effort should be made to so protect members of the profession who enlist; it is recommended to each of the nine Divisions of the Association that this matter be carefully studied and that appropriate steps be taken in regard thereto.

MEMBERSHIP FEES OF DOCTORS ENLISTING FOR ACTIVE SERVICE

It was the opinion of the Committee that members of the C.M.A. who enlist for military service should be carried on our membership roll without the payment of fee during the period of their service. The following resolution was passed:

> That, during the progress of the war in which Canada is now engaged, the Canadian Medical Advisory Committee recommends that the membership in the C.M.A. of doctors who proceed overseas on active service in the army, in any branch of the service, shall be continued in good standing without the payment of any fee, this to take effect at the expiration of the last calendar year for which the fee has been paid; but that, unless specifically requested by the doctor so carried, the *Journal* shall not be sent to such doctor during the period of his absence from Canada; and that a copy of this resolution be published in the *Journal* and also sent to each Division.

C.M.A. JOURNAL TO MILITARY MEDICAL UNITS

It was agreed by the Canadian Medical Advisory Committee that during the period of

the present war a copy of the *C.M.A. Journal* should be sent to the officer commanding each Military Medical Unit of the Canadian Active Service Forces overseas, to take effect from January 1st, 1940.

Enlistment for a Limited Time

It was suggested to your Canadian Medical Advisory Committee that it would be advisable to approach the Government to inquire if it would be deemed feasible to allow medical men to offer their services overseas for a definite time, say six months or a year, then being permitted to return to practice, and the place vacated being taken by another doctor, also on a definite limited time basis. This subject is under discussion at the present time with the Department of National Defence.

Nutrition

Having regard to the fact that the science of nutrition has made such rapid strides during the past twenty-five years, the value of which science should be made fully available to Canada's armed forces, your Canadian Medical Advisory Committee has recommended to the Department of National Defence that there be appointed an authority on Nutrition to see to it that the feeding of the troops is carried out most effectively. This subject has been discussed with the Department and is now under advisement.

Pay and Allowances for Medical Officers in C.A.S.F.

The following rates of pay have been authorized for professionally qualified officers of the Canadian Army Medical Corps:

Colonel	$12.50 per diem
Lieut. Colonel	11.00 " "
Major	9.25 " "
Captain	7.50 " "
Lieutenant	5.00 " "

In addition to the foregoing rates of pay officers of the C.A.M.C. will receive allowances at the same rates as officers of other arms of the service, and the officer in command of any hospital or institution in which the total personnel, including patients, under his command numbers 500 or over, or if the hospital is equipped with 500 beds or over, shall receive command pay of $1.00 per diem.

The allowances for married officers are as follows:

Officers above the rank of Major	$60.00 per month
Major	55.00 " "
Captain	50.00 " "
Lieutenant	45.00 " "

In addition to the above allowances for a wife, there is an allowance of $12.00 per month for each child up to the number of two, under the age of sixteen years in the case of a boy, and seventeen years in the case of a girl.

Subsistence allowance at the rate of $1.70 per diem is allowed for officers in Canada for whom no quarters are available.

The Red Cross War Council

The Canadian Red Cross Society has established a War Council to assist Canada's armed forces in a voluntary manner such as properly comes under the purview of the Red Cross Society. On invitation, the Canadian Medical Advisory Committee has appointed two members to this War Council in the persons of Drs. Duncan Graham and T. C. Routley, of Toronto.

Division of Authority Between the N.M.C.C. and Divisional Committees

The division of authority between the National Committee and the Divisional Committees has been set forth as follows:

1. That the C.M.A.C. should deal with matters of general and national interest in co-operation with the Departments of Government concerned.
2. That matters of local concern, such as the selection of personnel in a District, should be dealt with by the Divisional Advisory Committee.
3. That, in the selection of such personnel, more particularly O.C.'s of Medicine and Surgery, the first consideration should be given to professional qualifications and experience.
4. That in case of local difficulties or misunderstandings arising within a Division which the Division does not feel disposed to settle, the matter be referred to the C.M.A.C.
5. In the event of the Divisional Advisory Committee being aware of matters of general or national interest which should be communicated to the C.M.A.C., that the Divisional Advisory Committee be requested always to take such action.

Continuity

The Canadian Medical Advisory Committee is keeping in constant touch with the authorities at Ottawa and also with the National Medical Co-operative Committee and the Divisional Advisory Committees.

Watch *The Journal* each month for further details of important decisions and developments.

T. C. Routley,
General Secretary.

Radio Broadcasting

At the Montreal meeting last June, General Council received and accepted an invitation from the Canadian Broadcasting Corporation to provide a series of health talks beginning in the autumn of 1939. Arrangements were subsequently completed whereby the Association undertook to provide 32 fifteen minute health talks over the facilities of the C.B.C. trans-Canada hook-up, the time selected being each Wednesday evening from 7.45 to 8.00 o'clock, Eastern Standard Time. A special committee

under the chairmanship of Dr. T. H. Leggett, of Ottawa, was appointed to take charge of the program. The broadcasts will be given by the General Secretary, or, when he is not available, by the Associate Secretary.

The series began on Wednesday evening, November 22nd, and it is anticipated that each Wednesday throughout the winter months a talk will be given.

This undertaking involves a considerable amount of effort on the part of the Association and its officers. It was represented to the Association as a duty to be performed in the public interest. Naturally we shall be glad to know, as well as can be gauged, whether or not our efforts are worth while. Members are invited to make a note of the broadcasts and publicize them in any way they see fit. Suggestions, comments and criticisms will be welcomed.

Hospital Service Department Notes

Interns Being Placed Through the Canadian Intern Board

The appointment of interns for the coming year to a large number of Canadian hospitals is being done through the Canadian Intern Board, an arrangement being set up to eliminate as much as possible the present confusion and delay experienced by so many hospitals in completing the appointment of interns.

This effort has been initiated by the students themselves through their national organization, the Canadian Association of Medical Students and Interns. The Canadian Intern Board is composed of three members, Dr. Ansley Seymour, assistant superintendent of the Vancouver General Hospital, representing the Canadian Hospital Council, Dr. Fred A. Logan, assistant superintendent medical of the Toronto General Hospital, and Mr. William Kerr, Secretary of the C.A.M.S.I. There is also a representative Advisory Board, of which Sir Frederick Banting is chairman.

Correspondence during the summer indicated that the student bodies in those medical schools not having undergraduate internships desired the arrangement, as also did the great majority of the hospitals approved for internship. The arrangement does not apply where there are undergraduate internships. Accordingly, all students desiring graduate internship in Canada were requested to send to the Board by November 1st a list of those hospitals to which they had made application, listing these in order of preference. Hospitals were asked to check the applications received and send back by December 1st, on Form A, the names of those applicants who were their first choice. On Form B acceptable alternates were to be listed. The Board would then dovetail these lists, putting first choices together as far as possible. No intern would be placed in other than a hospital of his choice and no hospital would be assigned an intern not its first choice or listed as an acceptable alternate. The advantages will be (*a*) reduction to a minimum of the long period of correspondence, of cancellations and of annoyances; and (*b*) reduction of the disturbing uncertainty that interferes with the work of the senior student. Not all students could be placed in the December allocation, nor could all hospitals obtain a full quota in view of the annual shortage of interns. However all hospitals with incomplete quotas will be furnished a list of those senior students not yet placed, and *vice versa*. It is impossible to do more than that and preserve the very desirable freedom of choice on both sides.

This is an experiment that seems to be well worth a trial. Not everybody can be satisfied, of course, but at least the difficulties and annoyances incident to the present chaotic situation should be greatly reduced. In the United States the American Hospital Association and the Association of American Medical Colleges have agreed, with the support of a great majority of the hospitals approached, to have all appointments as far as possible made on November the 15th. The Canadian plan goes a step further. There is a tendency for some hospitals having trouble in getting interns to "beat the gun" and book up their next year's quota in September or October. Such hospitals hesitate to take chances on a common date of appointment. However, their more promising acceptances are often cancelled later on when a more desirable opening occurs, and then it is usually too late for the first hospital to get anyone else.

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

The Cancer Campaign

The Cancer Situation in Saskatchewan

In 1930 the Saskatchewan Department of Health decided to do something about the rising cancer death rate. Hon. Dr. F. D. Munroe, then Minister of Health, brought in legislation setting up a Saskatchewan Cancer Commission. Two cancer clinics were opened, one at Regina in December, 1931, and one at Saskatoon in January, 1932. Each was staffed by three part-time physicians, namely, a radiologist, a surgeon and a physician. About two and a half grams of radium were bought, half a gram of which is used as radon emanations at the Department of Physics of the University of Saskatchewan under the direction of Professor Harrington.

In 1932 the two clinics treated 344 cancer

patients; in 1938 this number rose to 473. In addition to these 156 cases were examined in 1932 which were not cancer; in 1938 436 cases were examined which were not cancer.

Since the work was growing in volume and in importance the Cancer Commission decided in 1939 to appoint two full-time physicians in Regina, the director, Dr. H. C. George, and the radio-therapist, Dr. Allan W. Blair. Satisfactory arrangements could not be made to continue with the Regina General Hospital so the Regina Clinic was moved to the Regina Grey Nuns' Hospital.

The Grey Nuns built a wing on their hospital for the accommodation of the Cancer Clinic, which was formally opened by Premier Patterson on November 15, in the presence of Lieut. Governor A. P. McNab, Archbishop Monahan, and Hon. J. M. Uhrich, M.D., and others interested in welfare work.

The new wing was erected at a cost of $150,000.00 and consists of four storeys. The second storey was furnished jointly by the Government and the Grey Nuns' Hospital. In it is a surgery used for obtaining biopsies and for the insertion of radium, two examination rooms, a patients' waiting room, a business and record office, two physicians' offices, a consultation room, and the therapy department. The therapy department is equipped with a General Electric 220 K.V.P. Maximar machine and one Picker 400 K.V.P. with two treatment portals enabling two patients to be treated at the same time. The therapy technicians are Miss Doris Taylor, a graduate of the Toronto General Hospital, who has had ten years' experience under the direction of Dr. Richards in the Toronto General Hospital, and Miss I. Boisvert, a graduate of St. Boniface Hospital, who is in charge of treatments on the 220 K.V.P. unit. The third and fourth storeys provide twenty beds for men and twenty for women patients. The hospital provides pathological service under the direction of Dr. D. F. Moore and x-ray diagnostic service under the direction of Dr. A. E. B. Perry.

A recent average month's work consisted of seeing 122 patients in review and about 50 new patients.

The surgical consultant is Dr. F. C. Corbett who gives only part of his time to the work. If a patient requires operation he is referred back to his attending physician for the necessary arrangements. If the patient is a stranger from out of town and requires surgical treatment in Regina his home physician is asked to designate the Regina surgeon whom he wishes to handle the problem, or, if he wishes, the patient may personally exercise his right of selecting the surgeon he desires. In other words, the staff of the clinic act only in a consultative capacity, leaving it entirely to the patient and his personal physician as to who shall be called upon to perform any operative procedure recommended.

Saskatchewan believes that cancer can, in many cases, be cured, that because the treatments are inordinately expensive the cost should be borne by the province as a whole, that there are means by which cancer can be cured, and the government will undertake to get these to all the people. At present treatment is not free; a fee of $10.00 is charged for diagnosis; this includes all necessary laboratory examination, x-ray plates, and physical examination. The patient, if able, pays a small amount for his own radium or x-ray therapy; for his own surgery and for his own hospital accommodation. But the people of Saskatchewan know all about free tuberculosis treatment and they are already talking in terms of free treatment for cancer.

Though centralization of cases is recognized as being fundamental to the successful prosecution of cancer treatment it is considered by some physicians to have its drawbacks. When the physician puts his patient on the train for the Cancer Clinic he feels that something of the intimate relationship between him and his patient has gone, but knowing that modern and expensive treatment must necessarily be centralized and that it is for the patient's own good he relinquishes his personal claim temporarily. The Clinics earnestly strive to co-operate with the attending physician in every possible way. They invite him to attend the examination of the patient and the consultation; he receives full written reports on every case and copies of any letters sent to his own patients. When this is done the relationship between the patient and his personal physician is strengthened rather than weakened.

The Saskatchewan Branch of the Canadian Society for the Control of Cancer is becoming active and branches will soon be formed in the cities, towns and villages. Organizations already particularly interested in cancer are the Provincial Council of Women, the Saskatchewan Homemakers and the United Commercial Travellers who donated $1,500 to the Society this fall. These societies have representatives on the provincial executive.

It is interesting to note that in Saskatchewan the commonest site of cancer is the skin; this is thought to be due to the dry windy weather. The next most common site is the lip. Of the 473 cancer cases admitted in 1938 the most common sites affected were skin 92; lip 77; breast 71; glands 70; female genitalia 47; stomach 29; rectum 25. These account for 78 per cent of the cases.

The Saskatchewan people are not the type to sit down under a calamity and wail about it. When the horror of the rising cancer death rate was borne in on them they made arrangements to stem its rise. With the possession of good equipment and well-trained personnel the next step is to educate the public to come for early diagnosis.

LILLIAN A. CHASE.

The Canadian Society for the Control of Cancer

Mr. Don G. McMaster has been appointed Executive Secretary of the Canadian Society for the Control of Cancer.

Born in Vancouver in 1909, he received his early education there and graduated from King Edward High School. He has been connected with a bank, a railway and Swift and Company of California as Assistant to the Manager of the Northern California Live Stock Show. Later he became associated with his father, Mr. E. B. McMaster, of Vancouver, in the operation of a business which provided organization work, secretarial duties, and business management for a group of Associations, Clubs and Societies, which included the handling of affairs for trade and business clubs, professional associations and fraternal organizations. This has given him a very broad experience in all types of organization work. In conjunction with these endeavours he has been in close contact with the advertising profession in all its branches and has carried on publicity and propaganda work. Mr. McMaster has resided in Toronto during the past year where he has been carrying on a similar type of business.

A member of the United Commercial Travellers of America, Mr. McMaster conceived the idea of staging a nation-wide coronation celebration, the proceeds to go towards cancer work in each of the Provinces. He visited United Commercial Travellers Councils in all the Provinces and succeeded in interesting particularly Manitoba, Saskatchewan and British Columbia, and the Alberta Travellers have since become interested in the Society. He conducted one of Vancouver's most successful campaigns which raised a considerable sum for the British Columbia Cancer Foundation. He was associated with his father, E. B. McMaster, Secretary of the British Columbia Branch of the Canadian Society for the Control of Cancer, in the early stages of development of that Branch. Prior to coming to Toronto he did work among juvenile delinquents and tuberculosis sanatorium outpatients. Mr. McMaster will have the co-operation of the Canadian medical profession in furthering the work of the Canadian Society for the Control of Cancer.

The British Columbia Cancer Institute

A brief survey of the work of the British Columbia Cancer Institute during its first year of operation is of interest. This Institute is located at Vancouver, and the report of Dr. A. Maxwell Evans, its Medical Superintendent, shows that a great deal of excellent work is being done by it. The Institute is the Vancouver station of the British Columbia Cancer Foundation, established four years ago.

In the first year of treatment, 288 patients have been seen at the Institute; 176 had cancer, and 126 received radium treatment. Patients came from all parts of the province and no one was refused treatment. One hundred and seventy-six indigent patients were treated, and financial responsibility for the other 112 was assumed either by the individual or by organizations such as the Department of Pensions and National Health, Provincial Welfare, Municipalities, etc.

The analysis of the types and location of malignant growths is of great interest, and shows a large number of accessible carcinomata, *e.g.*, skin, lip, tongue, etc.

While the Institute makes use of radium, it also utilizes all available methods—surgery, deep x-ray therapy, and so on. It has made connections with the Vancouver General Hospital and St. Paul's Hospital, with a view to the exhibition of these other methods of treatment.

Medical Societies

Calgary Medical Society

At the regular monthly meeting of the Calgary Medical Society held on November 14, 1939, a symposium on diabetes mellitus in children was presented. Dr. M. G. Cody presided. Dr. A. F. Hardiment dealt with the physiology and pathology, Dr. G. O. Prieur with the diagnosis and Dr. E. B. Roach, with the treatment of this disease.

At a special meeting of the Calgary Medical Society, Dr. E. B. Reed, Director of Physiological Research at the Lister Foundation, Shanghai, China, gave a very illuminating address on Chinese medicine entitled "Symbolism in Chinese medicine in relation to the dragon."

Upper Vancouver Island District Medical Association

The Upper Vancouver Island District Medical Association held its annual meeting on November 30th, at Casa del Mar Hotel, Nanaimo. The following were elected officers of the Association: *Hon. President,* Dr. W. F. Drysdale, Nanaimo; *President,* Dr. E. D. Emery, Nanaimo; *Vice-President,* Dr. N. B. Hall, Campbell River; *Hon. Sec.-Treasurer,* Dr. A. B. Hall, Nanaimo.

Following dinner Drs. D. E. H. Cleveland and S. G. Baldwin, of Vancouver, presented papers on "Allergy in dermatology" and "Obstetrical problems", respectively. Dr. M. W. Thomas, the Executive Secretary for British Columbia, also attended and spoke briefly.

Letters, Notes and Queries

Pulmonary Embolism

To the Editor:

It has been pointed out to me by Dr. T. H. Belt, of the British Post-graduate Medical School, that the series of cases referred to in my paper on "Pulmonary Embolism" (*Canad. M. Ass. J.*, 1939, **41**: 271) included cases quoted by him in a previous publication "Thrombosis and Pulmonary Embolism" (*Am. J. Path.*, 1934, **10**: 129). I therefore would like to correct any misconception regarding the overlapping of these two series.

Dr. Belt quoted 56 pulmonary emboli found in a period of 18 months up to April, 1933. The series I quoted included 367 cases found during 1931 to 1936 inclusive and were culled independently. The great majority of the cases quoted in my article were diagnosed at autopsy, though toward the end of the series an increasing proportion were being picked up clinically as well.

BURNS PLEWES.

Toronto,
November 29, 1939.

Corrigendum

To the Editor:

An error occurred in the report of the Manitoba Medical Association meeting on page 506 of the November issue of the *Journal*, where it was said that "Mr. Wolfenden expressed himself as being in favour of nation-wide health insurance". Mr. Wolfenden discussed only the characteristics of many different forms of health insurance, and considered the extent to which they may be applicable under the particular and varied conditions of the Canadian people. He did *not* express himself as being "in favour of nation-wide health insurance"; his remarks, and the ensuing discussion, emphasized throughout the desirability of exploring the whole subject much more deeply before adopting any definite position with respect to the appropriateness of health insurance in Canada, whether nation-wide or otherwise.

ROSS MITCHELL.

Winnipeg,
December 4, 1939.

Answers to letters appearing in this column should be sent to the Editor, 3640 University Street, Montreal.

Medico-Legal

A Surgeon's Expenses

In cases of personal injury to a poor person who is claiming as part of his special damages the amount of a surgeon's bill, the suggestion has sometimes been made that the surgeon has no right to greater remuneration than he would have demanded if there had been no action (and the resources of an insurance company had not been available). Mr. Justice Croom-Johnson disposed effectively of this idea in a case which he tried at the Manchester spring assize on May 11th. A nurse had her nose broken in a traffic collision; the driver admitted liability and the learned judge had merely to decide on the amount of the damages. She claimed, among other expenses, sixty guineas for an operation by a distinguished surgeon. He had rendered his account more than two months before the writ was issued. The driver said that as the surgeon would not in the ordinary way charge a nurse anything and would not sue her if she did not pay, the nurse was not legally liable to pay the surgeon anything. and therefore the driver should not be obliged to pay her anything in respect of the surgeon's services. After pointing out that the operation had largely minimized the damages which the driver might have had to pay, his lordship said that the surgeon's motive for rendering this account—that he knew that the nurse would be able to claim compensation—was immaterial. If a person engages a doctor to come and look after him, said the judge, the ordinary implication arises that he will pay the doctor a reasonable fee. Unless the doctor communicates to the patient that the services are gratuitous, he is entitled to send in a bill. When the patient is a doctor, a doctor's widow, or a nurse, what the patient is to pay must be left to the benevolence and good sense of the medical attendant. His lordship knew of no reason why a doctor should not send in a bill to another doctor if the circumstances warranted it, nor why this surgeon should not have sent in a bill to the nurse because he thought the circumstances did warrant it. Although he might never have sued her for the money, he had a strict legal right to do so. The surgeon had therefore done nothing to debar himself from making a claim against the nurse for the fee, and this item of special damage could properly be charged.—*Brit. M. J.*, 1939, **2**: 626.

WISE MEN SAY:

That little men have short tempers.

That it is not work that kills men; it is worry.

That if you and your job are not friends part company.

That the longer you live, if you live right, the less you will think of yourself.

That following the line of least resistance is what makes rivers and men crooked.

That determination reduces hard work to nothing; procrastination makes hard work out of nothing.

That to keep watching, to keep working, to let the brain and hand go together—that is the secret of success.—*Exchange.*

Abstracts from Current Literature

Medicine

Transfusion with Stored Blood. Leedham-Green, J. C.: *Brit. M. J.*, 1939, **2**: 849.

The advantages of a ready supply of stored blood are manifest. A further advantage is the diminished risk of transmitting syphilis. According to Neisser (1914) the *Treponema pallidum* loses its virulence after twenty hours in an ice-chest. The author gives his experience with 60 transfusions of stored blood at the General Hospital, Birmingham. The donors were either Group II or Group IV (Moss). The blood is collected in a graduated quart milk bottle in which a negative pressure is maintained. The average amount of blood collected from each donor was 600 c.c., and this was mixed with 100 c.c. of 3.8 per cent sodium citrate solution. The bottle is then sealed with sterile cotton wool. A test tube with a few drops of the donor's blood in citrate solution for the cross-agglutination test between the donor's corpuscles and the recipient's serum is attached to the bottle with a rubber band. Finally, the bottle is labelled with the date on which the blood had been taken, and the group, and immediately conveyed to a refrigerator which maintains a temperature of about 4°C.

The average length of time the blood was kept before it was used was 5.5 days. The longest period was twenty-eight days, and no reaction followed the transfusion of this blood. The author thinks that the reaction rate from stored blood is no higher than from fresh blood.

Hæmolysis which is apparent to the naked eye usually starts after the blood has been stored from ten to fourteen days. Blood in which the superatant plasma has turned red should be discarded, but a slight degree of hæmolysis does not appear to give rise to any unpleasant sequelæ. Occasional samples of the stored blood were cultured and were found always free from microbic contamination.

ROSS MITCHELL

Observations on Human Blood Stored at 4 to 6 Degrees Centigrade. Belk, W. P., Henry, N. W. and Rosenstein, F.: *Am. J. M. Sc.*, 1939, **198**: 631.

The authors have made observations on changes in 10 samples of citrated human blood kept at 4 to 6°C. for a period of 20 days. They observed no change in the hæmoglobin or the oxygen capacity. The red cells did not diminish in numbers, but their fragility to sodium chloride solutions underwent a progressive increase from the normal of 0.44 to 0.85 per cent on the twentieth day. By the 15th day hæmolysis began in 0.83 per cent NaCl, a concentration almost equivalent to normal blood serum. In 10 days the granulocytes had almost disappeared. The prothrombin time, as measured by Quick's method, showed a steady rise from 22 seconds to 38 seconds. The platelets showed the most rapid drop—from 216,000 per c.m.m. to 92,000 in 24 hours and 44,000 in 48 hours, thereafter remaining fairly constant. The plasma carbon dioxide combining power fell from 43 volumes to 10 volumes per cent on the 20th day.

They therefore conclude that blood stored in a blood "bank" should not be used in the treatment of such conditions as agranulocytic angina, purpura hæmorrhagica, hæmophilia, vitamin K deficiency or other hæmorrhagic diseases. They believe in any case that such blood should be used within a few days of collection; that the arbitrary limit of 14 days is much too long. For these reasons they feel that a blood bank is ill-advised for small hospitals doing fewer than 100 transfusions per month.

E. S. MILLS

Surgery

Etiology of Gallstones. Carter, R. F., Greene, C. H., Twiss, J. R. and Hotz, R.: *Arch. Surg.*, 1939, **39**: 691.

The cause of gall stones must be sought in many factors. These resolve themselves into two groups. The first is related to changes in the composition of the hepatic bile, whether due to aberrations in the general metabolism (hypercholesterolæmia, diet, systemic disease or pregnancy) or to disease or injury of the liver; the second group is related to changes taking place directly in the gall bladder or bile ducts and favouring the formation of calculi. The present survey was made to see whether in a series of patients with and without gall stones, and with either disease or dysfunction of the gall bladder, the operative findings could be correlated with the results of a detailed chemical and bacteriological study in such a way as to throw additional light in the applicability of the different items of origin of the gall stone. The authors state, that the findings in this study furnish presumptive evidence that the composition of either the hepatic bile or of that obtained by duodenal drainage is not related to the changes in the chemical composition of the blood, and that the cholesterol content of the gall bladder as determined at operation is not related to the cholesterol content of the blood. The bile salt-cholesterol ratio is widely variable in all types of pathological changes of the gall bladder and is often very low in non-calculous gall bladders and hypercholesterolæmia, as determined by preoperative studies of the blood, is not related to the presence of stones. Pancreatic ferments are as common in non-calculous gall bladders as in those with calculi.

In 25 per cent of patients in whom gall stones were present stasis was the only one of the factors considered in the pathogenesis of stones which could be demonstrated. There is a strong presumption, therefore, that stasis is of importance, though there are other unknown factors.

In 24 patients there were gall stones unassociated with any bacteriological or pathological evidence of infection or inflammation, showing that infection is not necessary to the formation of stones and affording presumptive evidence that in many instances stones precede infection of the gall bladder.

G. E. LEARMONTH

Meckel's Diverticulum. Persson, T.: *Acta Chirur. Scand.*, 1939, **82**: 530.

In reviewing 15 cases the author has come to the conclusion that Meckel's diverticulum may be suspected in the following conditions, (1) in a disturbed healing of the umbilicus postnatal, (2) in adenoma of the navel and other congenital conditions in the ventral wall, (3) in cases of umbilical colic with local tenderness, (4) in cases of profuse bright red intestinal hæmorrhage, particularly in children. Repeated exposures to x-rays with a small amount of contrast medium are helpful in diagnosis. Perforation of the diverticulum does not occur as a diverticulitis but by mechanical perforation of a foreign body. Perforation takes place without many symptoms and the symptoms of peritonitis may be mild and subfebrile.

FRANK DORRANCE

Ueber Meniskusschaden. Efskind, L.: *Acta Chirur. Scand.*, 1939, **82**: 499.

The author gives the follow-up observations on a group of 32 patients who have had menisci of the knee removed. Some of them are of 5 years' duration. Roentgenologically, he has found lessening of the joint-spacing on the side operated on, both immediately after operation and at later dates. There is no lessening of the joint space when arthritis has taken place. All of these x-rays were taken with the patients standing. His conclusions are, (1) the meniscus does take part in the supporting mechanism of the femoral condyles; (2) regeneration of the meniscus, if it does take place, is of a material inferior to the first one; (3) post-operative effusion does increase the incidence of arthritis.

FRANK DORRANCE

Obstetrics and Gynæcology

Management of the Frank-Breech Presentation. Crosse, V. M.: *Brit. M. J.*, 1939, **2**: 113.

A series of 100 cases of breech with extended legs is reported from the Municipal Maternity Home, Birmingham. The management of the delivery was kept as simple as possible; there was no interference except fundal and suprapubic pressure, unless definite indications arose. There were four stillbirths and five neo-natal deaths. Delay due to splinting of the legs occurred in only four cases. Extension of the arms was not a common complication in the absence of traction. It occurred in three cases only. Routine delivery of the head with forceps was unnecessary. The forceps was needed in only two cases. Episiotomy is advisable especially in primiparæ. The conclusion reached is that a relatively low infant mortality rate can be obtained if the frank breech is delivered, with a minimum of interference, by a skilled team of attendants, preferably in an institution.

ROSS MITCHELL

Ruptured Graafian Follicle and Corpus Luteum with Intra-abdominal Hæmorrhage Simulating Acute Appendicitis and Ruptured Ectopic Pregnancy. Weil, A. M.: *Am. J. Obst. & Gyn.*, 1939, **28**: 288.

The differential diagnosis between rupture of Graafian follicle and corpus luteum with hæmorrhage and appendicitis or ectopic pregnancy is discussed. The only characteristic symptom noted in rupture of the Graafian follicle and corpus luteum was sudden pain, and this occurred in every instance.

In this series rupture of the ovarian sexual apparatus occurred most frequently in young women up to 25 years of age, and most often on the right side. Correlation between the menstrual cycle and ruptured Graafian follicle and corpus luteum with bleeding is mentioned. Similar quantities of blood loss were noted in both Graafian follicle and corpus luteum rupture.

It is suggested that when the diagnosis of lower abdominal conditions warranting surgery in the female is in doubt either a right rectus or midline incision should be made so that visual inspection of the internal genitalia may be accomplished. Abstracts of five cases not operated on, diagnosed as ruptured Graafian follicle with slight intra-abdominal hæmorrhage, but not so proved, are presented. A case of ruptured left corpus luteum with hæmorrhage complicated by incomplete intrauterine abortion is reported.

ROSS MITCHELL

Tubal Sterilization by the Madlener Technique. von Graff, E.: *Am. J. Obst. & Gyn.*, 1939, **38**: 295.

The tubal sterilization according to Madlener is recommended as the procedure of choice in the permanent sterilization of women. The advantages of the original Madlener over other methods, including the cornual wedge operation, are described. Of 4,279 cases from the literature 99.7 per cent have proved successful. This includes 304 cases reported for the first time by the author, with only one failure. The causes of failure are pregnancy at the time of operation, mistaking the round ligament for the Fallopian tube, slipping of the ligature, and lacerations of the serosa which encourage fistula. The cutting of the tied loop of the tube is likely to invite failure and should therefore be omitted. The advantages of the vaginal route in the performance of sterilization, as well as in pelvic surgery in women on the whole are emphasized.

ROSS MITCHELL

Pædiatrics

The Accidental Transmission of Malaria. Nabarro, D. and Edward, D.: *The Lancet*, 1939, **2**: 556.

None of the recent reports of the accidental transmission of malaria have brought home this danger so strikingly to pædiatricians as the recent report of Professor Nabarro. A new-born infant was given an injection of whole blood to arrest a bleeding tendency (hæmorrhagic disease of newborn). The child did well for one month after this, but then began to have febrile attacks and on re-admission was found to have quartan malaria. She eventually died of this disease.

Further investigation elicited the information that the father had lived 12 years previously in Ceylon, where he had taken prophylactic doses of quinine, but had never developed symptoms of malaria. Although the parasites were difficult to find in the father's blood it was possible to infect a general paralytic patient with malaria by injecting his blood. These observations show that every person who has ever had malaria or who had lived in a country where malaria is endemic should be excluded from acting as a donor of blood, unless exhaustive tests are undertaken to prove that he does not carry these parasites.

REGINALD A. WILSON

Ophthalmology

The Paralyses of Movements Associated with the Eyes: Clinical and Physiopathological Study. Morax, P. V.: *Ann. d'Ocul.*, 1939, **176**: 337.

In the normal state movements of the ocular globes are all associated binocular ones and occur in two principal forms:—(1) parallel movements, when the eyes are moved in the same direction, that is, horizontal movements to the left and to the right, and vertical movements up and down; (2) non-parallel movements, convergent and divergent.

Pathologically, different functions of seeing might be altered or omitted, and here is found paralysis of movement, associated with the eyes in functional paralysis. Parinaud was the first to group the paralyses of movement associated with the eyes, although he was not the first to write on this subject. In a classical monograph he united them, showed their importance and clinical value. He showed four kinds of paralyses of associated movement; paralysis of parallel horizontal movements; paralysis of parallel vertical movements; paralysis of convergent movements; and paralysis of divergent movements.

The article is divided into numerous headings: (1) examination of the associated ocular motility, in which is considered both voluntary and reflex movement; (2) complete ophthalmological examination, subdivided into ocular-motor paralysis, pupillary modifications, retraction of the upper lid, visual disturbances, the cornea, measuring of the visual acuity, examination of the fundus when necessary; (3) complete neurological examination.

Under the second main heading are taken up the aspects and value of dissociation of voluntary and reflex movements, and this is subdivided into complete, incomplete dissociation, evolution, dissociation in hypertonic syndrome.

Diagnosis is then taken up, and the last part of the article is entitled Clinical Forms of Paralysis of Sight, which are divided into two groups, voluntary and automatic reflex. The first group is subdivided into voluntary paralysis of sight in all directions; paralysis of voluntary vertical movements of the eyes; paralysis of voluntary lateral movements of the eyes. The second group is subdivided into absolute paralysis of sight in all directions; absolute paralysis of vertical movements of the eyes and of the lateral movements.

S. HANFORD MCKEE

Fuso-spirochetal Infection of the Eye and Orbit. Walker, G. L.: *Am. J. Ophth.*, 1939, **22**: 622.

Ocular inflammation resulting from infection with *Borrelia vincentii* and *Fusiformis dentium* is rare. Gifford has pointed out that these bacteria are probably normal inhabitants of many mouths and that they take advantage of conditions of lowered resistance, or neglect of cleanliness, either to produce disease or to live as saprophytes on diseased tissue.

The case of a 47 year old white woman with arthritis and secondary anæmia, who complained of a discharging tooth socket and swelling and redness of the eyelids of the right side, is reported. The tooth socket had been draining since the extraction of a right upper molar three weeks previously. The lids of the eye were reddened and almost closed from œdema. A profuse yellowish-white foul smelling discharge exuded from the palpable fissure. Both the upper and lower palpable conjunctivæ were covered with pseudo-membranes. Smears from the conjunctiva showed large numbers of spiral and fusiform organisms. Gram-positive rods and Gram-positive-cocci were also present. The disease of the eye increased rapidly with the appearance of a perforating ulcer of the conjunctiva and sclera and involvement of the vitreous. Nineteen days after admission the patient developed fever, headache, photophobia, delirium, and two days later suddenly died. Necropsy showed a basal meningitis which appeared to have extended from the orbit along the optic nerve. On the basis of morphology and staining reaction it seems likely that Vincent's symbiotic organisms were present in this case. Probably the poor general condition rendered the patient susceptible to organisms ordinarily saprophytic.

S. HANFORD MCKEE

Neurology and Psychiatry

Gliomas of the Pons: Clinical and Pathological Characteristics. Alpers, B. J. and Yaskin, J. C.: *Arch. Neurol. & Psychiat.*, 1939, **41**: 435.

Most pontile gliomas occur in children. The tumours are generally of a slow-growing type, but as a rule the symptoms are of only a few months' duration. Paralyses of the cranial nerves are always present in greater or lesser degree. Paralysis of the abducens nerve is most frequent, and as an early symptom is very significant. The onset is often heralded by diplopia and headache, followed in a relatively short time by paralysis of the facial, trigeminal or vagus, and less often auditory and hypoglossal nerves, and by symptoms referable to the cerebellar pathways and the pyramidal tract. The cranial nerve paralyses are usually unilateral. Signs of increased intracranial pressure are generally absent, choked disc is rarely seen, and the spinal fluid pressure may be normal. The diagnosis is made on the basis of progressive involvement of the brain stem. The tumours generally cause gross enlargement of the pons but do not obliterate and aqueduct sufficiently to cause internal hydrocephalus. They are usually glioblastomata, less commonly astrocytomata.

FRANK TURNBULL

Histopathologic Changes in the Nervous System in Cases of Peptic Ulcer. Vonderahe, A. R.: *Arch. Neurol. & Psychiat.*, 1939, **41**: 871.

The relationship of changes in the nervous system to peptic ulcer is a question of considerable importance and of vast intricacy. Heretofore the emphasis has been largely placed upon the question of neurogenic causation of ulcer. This article presents in a thorough fashion a totally different viewpoint, namely, the probability of nervous system changes being secondary to the strong visceral afferent situation set up by the ulcer.

Fourteen cases were examined, 7 duodenal, 6 gastric, and 1 gastric and duodenal ulcer. In every case there was marked hæmorrhagic extravasation into the dorsal nucleus of the vagus, the substantia grisea of the third ventricle, and the nucleus reuniens complex of the thalamus. These findings were accompanied in some cases (number unspecified) by congestion of the brain, general or local.

The control of cerebral circulation is subject to several important influences: (*a*) Passive reaction to distant systemic changes such as splanchnic constriction or dilatation. (*b*) Chemical changes in blood composition may affect cerebral vessels directly, *e.g.*, pial dilatation in CO_2 excess or O_2 lack. This leads to increased capillary permeability, diapedesis, and eventual necrosis. Other toxic factors such as alteration in pH, vitamin C deficiency, and gastro-intestinal toxins have similar effects. (*c*) Vasoconstriction and vasodilation, which may, as suggested by Cobb, serve to create a local variability in cerebral circulation giving an increased blood supply to areas of activity. Basing his contention on the foregoing the author suggests that both general and local circulatory changes must be invoked to explain his findings. The local effects on the splanchnic vessels set up by an intra-abdominal condition, such as ulcer, together with the anoxæmia often associated with terminal conditions, may well account for the general cerebral congestion. The exquisite localization in hypothalamus, thalamus, and dorsal nucleus vagus calls for an explanation in terms of local vasomotor changes. In conclusion, it is suggested that the mounting pulse rate, so often seen, is explicable on the injury to the dorsal vagal nucleus removing inhibitory influences. Other sequelæ such as the irritability and emotional changes, metabolic changes, etc., are attributed to the hypothalamic and thalamic lesions. All too often, these symptoms are misunderstood and the patient upbraided as a neurotic.

G. N. PATERSON-SMYTH

Pathology and Experimental Medicine

Renal Changes in Malignant Hypertension. Wilson, C. and Byrom, F. B.: *The Lancet*, 1939, **1**: 136.

The authors, using rats, were successful in producing hypertension by partially occluding one renal artery, the opposite kidney being left intact. They were able to demonstrate histological changes in the arterial vessels in the opposite kidney consisting of acute arterial necrosis and other changes identical with lesions of malignant hypertension in man. No such changes were found in the kidney whose artery was partially occluded.

They concluded that arterial changes are the result of hypertension. In man, these changes occur in terminal Bright's disease, and constitute a vicious circle. They maintain that hypertension produces renal vascular lesions which in turn by further reducing the blood flow through the kidneys, aggravate the hypertension and lead to rapidly progressive renal destruction and functional insufficiency. LEYLAND J. ADAMS

Arteriosclerosis and Partial Obstruction of the Main Renal Arteries in Association with "Essential" Hypertension in Man. Blackman, S. S. Jr.: *Bull. Johns Hopkins Hosp.*, 1939, **65**: 353.

The author studied a series of 50 autopsies of essential hypertension and 50 control cases without hypertension. The distribution of age, sex and race in the two groups was comparable. The renal arteries were examined by making a number of parallel cross sections with a sharp knife. Blocks for microscopical sections were cut through the point of greatest narrowing.

Results: In the series of 50 cases of essential hypertension, arteriosclerotic plaques were found to project into the lumina of the arteries in 43 cases (86 per cent). The lumen of one or both renal arteries was stenosed to a marked degree in 27 cases, (54 per cent), to a moderate degree in 16 cases (32 per cent), and 7 cases, (14 per cent, showed no significant narrowing.

The author concludes that these arterial lesions may have caused sufficient partial occlusion of the renal arteries and their branches to induce chronic hypertension by the mechanism which Goldblatt and others have shown to be effective in experimental animals. A degree of arteriosclerosis and stenosis of main renal arteries comparable to that seen in some of the cases of hypertension was found in 5 of the control cases (10 per cent).

LEYLAND J. ADAMS

Hypertrophic Pyloric Stenosis in Twins. Card, T. A.: *J. Pæd.*, 1939, **14**: 658.

Hypertrophic pyloric stenosis is much more common in males than females, and has been said to be unduly common among first-born children. The parents in this family were Mexicans who had had two boys and two girls. The identical twin boys who were the patients were the result of the fifth pregnancy. Both had pyloric stenosis; the one was operated upon on the 28th day, and died on the 35th; the other was operated upon on the 33rd day and survived. Card cites several other families in which more than one boy was affected, and also several in which twins were affected. He states that there is evidence that hereditary factors play some role in determining hypertrophic pyloric stenosis.

MADGE THURLOW MACKLIN

Therapeutics

The Value of Colloidal Aluminum Hydroxide in the Treatment of Peptic Ulcer. Woldman, E. E. and Polan, C. G.: *Am. J. M. Sc.*, 1939, **198**: 155.

The authors have treated 407 patients with peptic ulcer by means of the continuous administration of colloidal aluminum hydroxide. Their conclusions are that this method has advantages over all other forms of treatment. Pain is relieved at once and the ulcer heals in from 7 to 10 days. The method is of particular value in cases of ulcer with massive hæmorrhage. In a series of 101 such patients only 3 died, a mortality percentage far below that for other forms of therapy.

The technique of administration requires constant and continuous medication both day and night. If given in the usual way not more than one hour should elapse between doses. A preferable method of administration, particularly in cases of bleeding ulcer, is by the continuous drip method (15 drops per minute) delivered through a Levine tube or preferably a soft rubber tube of about ¼″ diameter. The authors have found this tube to be entirely non-irritating to the nasopharynx and it may be left *in situ* until the ulcer is completely healed, usually 7 to 10 days. The difficulties of inserting this soft collapsible tube are overcome by threading into it a silkworm gut which acts as an obturation. The suture is left in position to prevent kinking and obstruction to free flow. The end of the tube should protrude only slightly into the stomach.

Food is taken every two hours and in addition to milk includes cream, cooked cereals, soft boiled egg, toast, butter, cream soups, gelatin custard, tapioca and junket. Mineral oil is given when constipation results. Sedatives are given to induce rest. Barbit malts, administered hypodermically, are preferable to morphia as there is less tendency to emesis or disturbance of normal gastro-intestinal function.

Although healing of the ulcer is usually complete, as demonstrated by radiological methods in 10 days, the authors recommend continuation of frequent feedings and 2 teaspoonfuls of aluminum hydroxide in 2 ounces of water every 2 hours during the day for an additional 30 days. But rest is considered essential during the initial period of the 10 days.

Since the tendency to peptic ulcer exists even after the ulcer has completely healed the patient is advised to take 2 teaspoonfuls of the antacid after each meal and at bed time, and to avoid coarse foods, condiments, alcohol and tobacco for an indefinite period.

E. S. MILLS

The Drug Treatment of Angina Pectoris Due to Coronary Artery Disease. Master, A. M., Jaffe, H. L. and Dack, S.: *Am. J. M. Sc.*, 1939, **197**: 774.

The authors have made a study of 116 ambulatory patients with præcordial pain attending the angina pectoris clinic at Mount Sinai Hospital, New York City. To this number, most of whom were receiving relief benefits, they added 85 patients seen in private practice. In all there were 125 males and 51 females, ranging in age from 35 to 75 years. All patients presented an anginal syndrome related to effort or excitement, with evidence of coronary artery disease. About one-third of the patients had a history of one or more attacks of coronary occlusion.

In all the effect of 16 drugs on the angina syndrome was recorded. Milk sugar was used as a placebo. The drugs included several xanthine derivatives, alcohol, sedatives, such as phenobarbital chloral and bromides, the nitrites, a tissue extract, digitalis, and two narcotics, codein and dilaudid. An analysis of the results showed that no drug was consistently successful in a significant number of cases. Some patients were helped by all drugs, others by none. The best results were obtained with the placebo, the number of patients showing improvement with this treatment ranging between 15 and 30 per cent for all drugs.

The authors believe that beneficial effects attributed to such drugs in the past may be explained on a purely psychological basis. They emphasize the importance of such measures as rest, dietary restriction, and minute attention to the mental and emotional status of the patient.

E. S. MILLS

Hygiene and Public Health

Infection of Air, Bacteriologic and Epidemiologic Factors. Wells, W. F., Wells, M. W. and Mudd, S.: *Am. J. Pub. Health,* 1939, **29**: 863.

For a number of years the authors have been studying the pollution of the air by bacteria. They have developed special techniques for bacteriological air analysis and have published many papers on the subject. The thesis of the present paper is that a more reasonable explanation of sudden epidemics of certain diseases may be found in the hypothesis that the infection is spread by the air by nuclei from evaporated droplets than in the usually accepted contact theory. The theory of contact ascribes the spread of infection to droplets expelled by infected persons (which are thought to have a relatively narrow radius of effect), and by transmission by hands and other infected articles. The authors' hypothesis would place air, so far as epidemic diseases usually thought to be spread by direct contact are concerned, in very much the same position as water or milk as a carrier of the infective agent.

Data are given establishing what appears to be a fact that the air of occupied indoor places contains a much higher concentration of viable bacteria than outdoor air. The principle arguments in favour of air-borne spread of disease, as opposed to the contact theory which is generally held, are: (1) the theory is consistent with the known facts of epidemic spread; (2) in certain laboratory epidemics droplets and contact can be rigidly excluded; (3) the velocity of spread of certain epidemics seems to the authors to be too swift to be accounted for by the usual explanation of contact.

FRANK G. PEDLEY

The leech should always be busy about things belonging to his craft. He must always be talking about it or studying it or be writing or praying, for the use of books brings a doctor a good reputation because it is both noticed by others and he himself becomes wiser thereby. And besides all this it is profitable to him that he be found always sober, for drunkenness destroys all virtue and brings it to naught, as sayeth a wise man "Drunkenness destroys whatsoever wisdom teaches". Let him be content in strange places with the meats and drinks found there, using moderation in everything. For the wise man says "As it is good to be moderate in everything that is, so without moderation everything that is perisheth".—Master John of Arderne.

Obituaries

Dr. John Ferguson, of Toronto, governor and for many years secretary of the Board of the Toronto Western Hospital, died on December 7, 1939. He was eighty-nine years of age. Dr. Ferguson was a graduate of the University of Toronto (1880) and had practised in Toronto for nearly sixty years. He was a life-member and former president of the Ontario Medical Association, which he helped to found in 1881, and a life-member of the Canadian Medical Association.

AN APPRECIATION

It is close upon four o'clock. A gentle knock on the door. It opens and in comes a little man with an umbrella. He sits down. His eyes twinkle and he begins to talk, perhaps in Latin, perhaps in poetry; maybe in my language; but, in any event, what he says is worth listening to. It is straight to the point, philosophical, understandable, and, withal, constructive.

He will come no more, but I shall always prize those visits. As he sipped his tea (five lumps, please) he would discuss By-laws, Federation, Post-graduate Lectures, Ethics, Organization, books, Journalism, and a wide variety of topics; but never once did he depart without imparting some wholesome and valuable information or advice upon the subject under discussion.

Of whom do I speak? Doctor John Ferguson, of course. That man of small stature but magnificent brain; a man quite whose like I have not known, and I knew him well. More than twenty years ago, at an age approaching 70, when most men are looking backward rather than forward, Dr. John (as I liked to call him) crossed my path. I was the young cub who had recently been appointed Secretary of the Ontario Medical Association. This young man of seventy extended to me the hand of friendship and helpfulness, and as I now review those years, I marvel to think of Doctor John's accomplishments. In committee, his legal mind asserted itself. In large groups, his summing up of a situation was comprehensive and his arguments convincing.

His outlook was always broad and unselfish. One instance comes to mind. When Federation of the nine provinces under the banner of the Canadian Medical Association was in its formative stage, Doctor John said to me on one of his delightful afternoon calls, "I am the only living charter member of the Ontario Medical Association and, naturally, I am anxious to see the Ontario Medical Association preserve its identity, but I would like to be the mover of a resolution that would carry that Association into Federation with the Canadian Medical Association because I believe in national unity."

When close upon 80 years of age Doctor John became President of the Ontario Medical Association and in that capacity toured the Province visiting all the District Annual Meetings, carrying to each one many gems of thought and wisdom.

The very beautiful badge worn by the Presidents of the Canadian Medical Association was a gift to the Association from Doctor Ferguson,—tangible evidence of his love for his Canadian brethren. And on his birthday, not once but several times, he quietly laid on my table a hundred dollar bond to be used by the Benefit Fund Committee of the Ontario Medical Association to provide help and succour to widows and orphans of his confrères.

One could go on at considerable length and then dismally fail to chronicle what should be said of Doctor John Ferguson. I think I hear him say, "Don't worry about me; I am all right. *Benedictus Benedicte*".

Doctor Ferguson lived long and usefully. He joyed in serving others. His name will forever be revered in Canadian Medicine. The little man with the umbrella will come no more.

T. C. ROUTLEY

Dr. William Francis Babb, of London, Ont., died on December 1, 1939, aged sixty-six. He was a graduate of the University of Western Ontario (1903). He had formerly practised at Thamesford and New York City for some years.

Dr. Henry Norman Bethune, of Montreal, a surgeon who won fame in two recent wars and also fought in the World War, died recently in Wupaishan, Shansi Province, China, of septicæmia due to injuries suffered while operating, according to a cable received on November 26th, by the China Aid Council, which sent Dr. Bethune's medical unit to the Orient. He was 49 years old.

In China Dr. Bethune had served with the Eighth Route Army's medical organization. From November, 1936, until May, 1937, he cared for the Spanish Government wounded in Madrid. His establishment of a systematized blood transfusion service there attracted world-wide attention.

Dr. Bethune was born at Gravenhurst, Ont., the son of Rev. Malcolm N. Bethune. He obtained his medical degree at the University of Toronto (1916), interrupting his studies to join the first Canadian contingent for France in 1914.

Wounded at Ypres, he was invalided home in 1915, finished his studies, and joined the Royal Navy, serving as surgeon-lieutenant on *H.M.S. Pegasus* until the armistice. He was appointed provincial medical officer of the Royal Canadian Air Force in 1920. He later went to Edinburgh University, obtained his F.R.C.S., studied in Vienna and returned to Canada in 1924. He joined the staff of Sacred Heart Hospital, Montreal, and was consulting surgeon to the Canadian Department of Pensions and National Health. He resigned these positions to go to Spain.

The Bethune family settled first in North Carolina, when Rev. John Bethune emigrated there from the Island of Skye, Scotland, in the last quarter of the 18th century. (The Bethunes were hereditary physicians to the Lords of the Isles.) A strong supporter of the British cause, he moved to Canada after the revolution as a captain of the Royal Highland Emigrant Regiment. He was the first minister of a Presbyterian congregation to meet in the city of Montreal, St. Gabriel's Church being his charge there. He later moved to Williamstown, near Cornwall.

Dr. Bethune's great-grandfather was connected with the Northwest Trading Company and was with the expedition which captured Astoria, on the Pacific coast of the United States, from the Astor family. This was about the time of the War of 1812. His grandfather practised medicine in Toronto.

Dr. Bethune was a surgeon of more than ordinary ability. He was inventor of several surgical instruments which today are widely used. He was a member of the council of the American Association of Thoracic Surgery.

Dr. Eugène Merrill Desaulniers, of Montreal, died on December 6, 1939. Born in Yamachiche of an old French-Canadian family, Dr. Desaulniers had studied at the Leblond de Brumath Institute and the University of Montreal, from which he graduated in 1897. Established in St. Lambert, County of Chambly, he occupied in turn the positions of school commissioner, councillor and mayor. Elected to the Legislature of Quebec as M.L.A. for Chambly in 1909, he was re-elected in 1912, 1916 and 1919. He was, while in Quebec, president of the private bills committee and vice-president of the Legislative Assembly. In 1922, he was named vice-president of the Quebec Liquor Commission, retiring on pension in 1936.

Dr. Joseph Edmond Dubé, of Montreal, Professor of Clinical Medicine in the University of Montreal for the past thirty years, died on November 25, 1939, aged seventy-one. He had been connected with the Hotel Dieu since 1896.

Dr. Dubé was born in Montreal on March 10, 1868, the son of Pierre Dubé and Henriette Levesque. He studied at Joliette, and then took up medicine at Laval University, Montreal, where he graduated in 1894. He then went to Paris for post-graduate work.

On his return to Montreal in 1896 he was appointed to the medical staff of the Hotel Dieu, and also became medical adviser to the Hôpital de la Miséricorde.

In 1903 he took part in the founding of the Royal Edward Institute and from then onward he engaged actively in educational work on tuberculosis. In 1909 and 1910 he took a leading part in a campaign of public education against alcoholism. In 1915 he conducted a campaign through the schools, urging the teaching of hygiene in all schools, convents and colleges throughout the province. He was one of the founders of the Bruchesi Institute, the Montreal Medical Society, and the Goutte de Lait.

Dr. Hubert Hayward, of Toronto, died on November 29, 1939. Dr. Hayward was born in Prescott, Ont., the son of Mr. and Mrs. Stephen Hayward, in 1912. He received his B.A. degree from Trinity University, Toronto, in 1934, and his M.D., from the University of Toronto in 1937. Following graduation he interned at Hamilton General Hospital, and in 1938 returned to Toronto General Hospital to study surgery under the Gallie Fellowship. He was studying under this scholarship at the time of his death.

Dr. Joseph Jordan, of Toronto, died on November 28, 1939, in his sixty-second year. Dr. Jordan served through the South African and Great Wars. While a medical student at University of Toronto he enlisted for service in South Africa, during which he was wounded. He served with the Queen's Own Rifles company of the Royal Canadian Regiment. After the war he returned to his medical studies and graduated at University of Toronto (1900). He practised in Meaford until 1915, when he enlisted in the 95th Battalion, C.E.F., as a medical officer with the rank of captain.

On his arrival in England Capt. Jordan was transferred to an imperial unit, with which he went to France. During most of the war he was attached to No. 2 Canadian General Hospital in France. He returned to Canada late in 1918.

For several years after the last war Capt. Jordan maintained his association with the non-permanent active militia as a medical officer. After the war he took up medical practice in Toronto.

Dr. John Francis Leo Killoran, of Toronto, died on November 17, 1939, aged sixty years. He was a native of Seaforth, Ont. He first taught school in Cornwall and then went to University of Toronto where he graduated in medicine in 1904. He immediately joined the St. Michael's Hospital staff, where he was chief of the anæsthetics department. During the first Great War he was a member of the examining board.

Dr. Angus William McPherson, of Peterborough, Ont., died on November 19, 1939, aged sixty-eight years. Dr. McPherson was born in Dutton, Ont., and had been a resident of Peterborough for more than forty years. He was a graduate of the University of Toronto (1907). In the field of public health Dr. McPherson ably served the community in two capacities. For a number of years before the Great War he was Medical Officer of Health for the city and soon after his return from overseas service he was appointed Medical Officer of Health for Peterborough's schools. Through his efforts, diphtheria was practically stamped out in the city. When the call came to Canadians to serve in the World War, Dr. McPherson offered his services and went overseas with the Canadian Army Medical Corps. He saw service with the Canadian division in France for some time and later was in command of the Canadian Convalescent Hospital at Bromley, Kent, England. Returning to Canada in 1919

he was appointed inspector of military hospitals throughout the country and carried on in that capacity for some time. After his return to Peterborough he acted as doctor for the Department of Soldiers' Civil Re-establishment, continuing in that capacity until ill health prevented him from serving further.

After the war he continued his interest in the militia as an officer of the 57th Battalion, and eventually rose to the command of the Peterborough Rangers, retiring afterward to the reserve of officers. He was always keenly interested in the battalion and in military training.

Dr. Paul Joseph Moloney, of Ottawa, provincial health officer of the Ontario Department of Health for Eastern Ontario from 1912 to 1935 and former mayor of Cornwall, died on November 12, 1939, in his seventy-fourth year. Born in Ennismore, Ont., he was a son of Francis Joseph Moloney and Johanna McCarthy, early settlers in that section from the Old Land. He received his education in the Ennismore Public School, later attending Peterborough Collegiate and the Ottawa Normal School. Dr. Moloney attended the Trinity Medical School, Toronto, from where he graduated with the degree of medical doctor in 1893. He served his internship at the Toronto General Hospital, and did post-graduate work in Buffalo and Toronto. He practised first in Perth, Ont., later moving to Cornwall, where he was on the staff of the Hotel Dieu Hospital and the Cornwall General Hospital. Dr. Moloney went to Ottawa from Cornwall in order that he might better serve the district of which he was health officer. Since 1920 he had held the rank of lieutenant-colonel in the Canadian Militia. For many years he was medical officer for the Stormont, Dundas and Glengarry Highlanders.

Dr. William Reginald Morse, of Lawrencetown, N.S., died at Boston, Mass., on November 11, 1939, aged 65. Doctor Morse had been engaged at Harvard University in anthropological study following his retirement in 1937, because of ill health from service as a missionary in China.

Dr. Morse was born in Lawrencetown, August 30, 1874. After teaching in the public schools of Nova Scotia he graduated from Acadia (B.A., 1897), and from McGill University (1902). After five years of practice in Yarmouth County, N.S., he moved to Providence, R.I., and from there to the Chinese mission fields. There he was amongst the pioneers in the establishment and growth of the medical schools and hospitals of West China Union University at Chengtu. In addition to his many appointments at Union University he was attached to the faculty of Harvard in surgery and anatomy, and held a fellowship in anthropology. He was a Fellow of the China Medical Board, the Rockefeller Foundation, a member and Fellow of many societies, amongst them being the Royal Geographical Society of London and the American Anthropological Association. In 1925 he received the honorary degree of LL.D. from Acadia University. Dr. Morse's writings were many, as contributions to journals and as books, ranging from anatomical and medical studies to the broader, humanitarian problems of the Chinese people. He was author of the Chinese translation of Rawling's, "Landmarks and Surface Markings of the Human Body" in 1926, "The Three Crosses in the Purple Mists" in 1928, and "Chinese Medicine", volume 11 of the Clio Medica series on the History of Medicine, in 1934.

Dr. James Melvin Park, of Hamilton, Ont., died on November 12, 1939, aged sixty-four years. He was a graduate of the University of Toronto (1903).

News Items

Alberta

The Government has organized 44 large school districts, believing that greater efficiency at less cost will result therefrom. One of the results of this new organization may be that preventive medicine as applied to school children will be on a higher level. Hitherto some schools had health examinations, vaccination and inoculation, which depended largely on the type of trustee elected, while other schools and neighbouring ones did nothing. It is thought that now arrangements may be made by the large districts and thus all in the area will be cared for. The population in the various districts varies, covering as they do, fertile, semi-arid and arid areas, thus the number of rooms vary from 11 to 45 and the number of school children from 3,400 to 400. One district is already contemplating doing the work and when this precedent is established others will follow. The Government had contemplated that if and when they organize a new Health Unit the boundaries will be coterminous with those of the larger school districts.

Dr. W. Harold Stockton, son of the late Dr. Frederick W. Stockton, of Calgary, has returned to Calgary after doing post-graduate work in pædiatrics, and will confine himself to diseases of children as his father did until his demise some twelve years ago.

Dr. E. Aiello, of Coleman, has moved to Pincher Creek, to take the practice of the late Dr. Dubuc.

Dr. M. E. Geissinger, of Daysland, has taken a contract practice at Hardisty.

Dr. J. V. Millions, of Westlock, has gone to Saskatchewan as M.O. of his former regiment.

The mental hospital at Ponoka has added some new members to its staff; Drs. W. M. McCallum and J. M. Byers replacing those who have taken up other work.

Dr. R. Parsons, Red Deer, and Dr. W. G. Anderson, Wardlow, have each been re-elected to membership in the Council of the College of Physicians and Surgeons of Alberta; this by acclamation. No councillor has been defeated the last twenty years when running to succeed himself.

G. E. LEARMONTH

British Columbia

The survey of the medical men of the province being conducted by the Canadian Medical Association through its British Columbia Division is proceeding most satisfactorily. Up to date 736 cards have been filled in and returned.

A drive is being undertaken by the British Columbia Medical Association to increase the membership from this province in the Canadian Medical Association, of which we are a Division. Through notices in the *Bulletin* and elsewhere, talks by the Executive Secretary, and in other ways, every effort is being made to further this most desirable object. The College of Physicians and Surgeons is giving its hearty co-operation and support in every way in which it can.

J. H. MACDERMOT

Manitoba

The re-opening of the Annex of Grace Hospital, Winnipeg, and the dedication of the new addition took place on November 28th, with Commissioner Benjamin Orames of the Salvation Army officiating.

Dr. A. L. Sigurdson addressed the Scientific Club of Winnipeg on November 28th on the "Control of arterial hæmorrhage". His communication was illustrated with a number of original lantern slides.

Ratepayers of Crystal City, Man., at a meeting on November 16th, heard Dr. F. W. Jackson, Deputy Minister of Health, discuss the pros and cons of the Municipal Doctor System. Arrangements are under way to submit a by-law to the municipality on this question at an early date.

A testimonial dinner was tendered to Dr. M. B. Halldorson at the Marlborough Hotel, Winnipeg, on November 28th. The occasion was Dr. Halldorson's 70th birthday. During the evening a desk set of Manitoba marble adorned with a buffalo was presented to the guest of honour, and this was accompanied by a scroll bearing signatures of the 150 present.

An unusually large number of retirements from the honorary attending staff of the Winnipeg General Hospital occurred recently. Those retiring were Dr. C. R. Gilmour, Physician and Professor of Medicine; Dr. W. A. Gardiner, Orthopædist and Lecturer in Orthopædic Surgery; Dr. J. A. Gunn, Surgeon and Professor of Surgery; Dr. D. S. MacKay, Gynæcologist and Professor of Gynæcology; Dr. A. Leishman, Assistant Laryngologist and Assistant Professor of Laryngology and Otology; Dr. E. H. Alexander, Assistant Ophthalmologist. New appointments to the three senior vacancies were Dr. O. S. Waugh, Chief of the Department of Surgery; Dr. J. D. McQueen, Chief of the Department of Gynæcology; Dr. J. D. Adamson, Chief of the Department of Medicine.

Iceland's only order of merit was awarded to two Winnipeggers, by His Majesty, King Christian X, November 22nd, when Rev. R. Marteinsson, Principal of Jon Bjarnson Academy, and Dr. S. J. Johannesson, physician and poet, were made Knights of the Royal Order of the Icelandic Falcon. The investiture was performed by the Western Canadian Consul for Denmark and Iceland, G. L. Johanneson, at the annual Founders' Day of the Jon Bjarnson Academy. The Order was created by King Christian in 1921 and is held by only some 40 persons on the American continent. It is not hereditary. Dr. Johannesson was knighted in recognition for both his original poetry and translations and also because he edits *The Baldursbra*, an Icelandic paper for children which is distributed throughout Canada and the United States.

ROSS MITCHELL

New Brunswick

Dr. A. B. Walter was the speaker at the monthly meeting of the Saint John Medical Society. He discussed hypertension with particular reference to its cardiac origin. The meeting was well attended and discussion was free.

Dr. G. M. White, Saint John, was recently elected President of the Kiwanis Club for 1940.

Dr. W. O. McDonald has just returned from attending meetings of a special committee of the National Research Council of Canada and another special committee of the Canadian Medical Association. Both meetings were held in Montreal. The subjects under discussion were the investigation of blood in military medical practice, and also a discussion relating to co-operation between the Government, military authorities and medical practitioners.

In the 1st Division New Brunswick will be represented by at least two medical men, Captain J. P. McInerney and Major D. W. F. Porter.

A. S. KIRKLAND

Ontario

Colonel E. G. Davis, C.M.G., V.D., is appointed Honorary Lieutenant-Colonel of No. 15 Field Ambulance, Canadian Militia (N.P.).

Dr. A. Riley Armstrong has been appointed clinical pathologist and director of the laboratories at the Mountain Sanatorium, Hamilton, succeeding Dr. W. S. Stanbury.

On Wednesday evening, December 27th, the V.A.D. members (1915-20) of the Central Nursing Division No. 1, Toronto Corps, St. John Ambulance Brigade, presented a portrait in oils to Dr. Charles J. Copp at the Art Gallery, Dundas Street, Toronto. This is the happy acknowledgment of Doctor Copp's many years of devotion to the St. John Ambulance Brigade, and marked particularly the important part he played in the training of V.A.D. groups during the Great War.

The building at the corner of Huron and College Streets, Toronto, formerly Grace Hospital, has been taken over for the purpose of a military hospital. It was first occupied by No. 15 Canadian General Hospital, which has been evacuated by them, and is now being carried on by a newly mobilized hospital serving the needs of this Military District.

The response of the profession to the Registration for the National Emergency being carried out by the Ontario Division has been most satisfactory; 3,850 questionnaires have been returned and the details have been recorded on punch cards for mechanical tabulation. There is now available information which will permit of the utilization of medical personnel where their professional qualifications will serve to the best advantage.

Associated Medical Services Incorporated has repaid the loan of $3,800 made by the Ontario Division in 1937. This serves to indicate the financial stability of this plan of voluntary prepayment for medical services, and suggests that satisfactory progress has been made in the brief span of its existence.

The Committee on Periodic Health Examinations of the Ontario Division has established a library on periodic health examinations and industrial medicine. In the December issue of the *Bulletin of the Ontario Medical Association* 102 titles are listed, and these articles are available on request to any member of the Ontario Division.

J. H. ELLIOTT

Nova Scotia

Johnstown, Cape Breton, is the seat of a newly-formed socialized health centre to provide medical aid for its members over a large rural area. Dr. Daniel McDonald, of Baddeck, one of the senior members of the profession on Cape Breton island, has co-operated with the members in the new effort and has opened an office in Johnstown. Aims of the organization are to promote the general health of the community, and to provide regular medical and surgical services at reduced cost. The group is made up of three hundred members, the heads of families, and may be enlarged by the admission of new individual members or new rural groups at the discretion of the board of directors.

Efforts are being made to obtain the services of a public health nurse for the district, and it is hoped that in the future an outpost hospital may be erected. Members of the association pay an annual fee of $5 which entitles them to one free visit by a physician to their home, and to free consultations at his office. Subsequent visits to the home are made at the rate of $2, plus one way mileage at ten cents a mile. Maternity cases are attended to for ten dollars, plus mileage. Reductions in the price of drugs, hospital charges and operation fees are being worked out.

Dr. J. G. MacDougall, Halifax, was re-elected president of the Provincial Medical Board at the annual meeting at Halifax. Other officers are: *Registrar*—Dr. H. L. Scammell, Halifax; *Executive Committee*—Drs. H. K. MacDonald, Halifax, M. G. Burris, Dartmouth,

J. J. Cameron, Antigonish. *Discipline Committee*—Drs. M. J. Carney, Halifax, and F. G. McAskill, Glace Bay. *Legislative Committee*—Drs. J. V. Reid, Truro, F. R. Little, Halifax, and H. K. MacDonald, Halifax.

Dr. Fred. W. Routley, assistant commissioner of the Canadian Red Cross, attended the annual meeting of the Nova Scotia branch of the Society at Halifax.

The western division of the Nova Scotia Medical Society met at Yarmouth, to honour Dr. H. H. Banks on the occasion of his silver jubilee as a practising physician. The presentation was made by his senior confrères, Dr. G. W. T. Farish and Dr. C. A. Webster, of Yarmouth, each of whom attained that distinction three years ago. Dr. Banks' career from the time of his Harvard graduation, in 1889, his charming personality, and his sterling devotion to the art of medicine through the years were revealed in the tales and reminiscences of his colleagues. Dr. Banks responded happily to the toast in his honour. Dr. G. V. Burton, of Yarmouth, presided over the gathering.

Dr. J. D. Griffin, of Toronto, addressed the annual meeting of the Nova Scotia Society for Mental Hygiene, at Halifax.

Dr. G. H. Murphy, of Halifax, was re-elected president of the local branch of the St. Francis Xavier Alumni Association at the annual meeting.

Hon. Dr. F. R. Davis, Minister of Public Health, has been appointed to the Victoria General Hospital as associate attending surgeon at large. Appointed to fill vacancies made by those called for military service are Dr. H. D. O'Brien and Dr. J. W. Merritt as assistant attending surgeons, and Dr. J. W. Reid as assistant attending physician.

The Inverness Memorial Hospital, completely destroyed by fire less than a year ago, has formally reopened its doors. The new building is more complete and larger than the old, and will give even better service to the people of the county.

ARTHUR L. MURPHY

Quebec

Montreal will soon have its first health centre in the Maisonneuve Clinic at Adam and Letourneux Streets, it was announced recently. Similar centres will shortly be established in other districts of the city.

Dr. Adelard Groulx, Director of the Montreal Health Department, believes that the creation of sanitary districts would decentralize the work, provide more intimate contact with residents and allow a closer study of problems affecting local hygiene. It would also help in checking infantile and maternal mortality and deaths attributable to tuberculosis and other contagious diseases, and would bring about closer co-operation between physicians and social organizations.

The health centres will includes offices for the chief district doctor and his staff and space for baby, prenatal, dental and mental clinics. The first district will include Prefontaine, Hochelaga, Maisonneuve and Mercier wards.

The first district chief physician will be Dr. J. A. Landreville, inspector of the child-health division, who has been in the department for 11 years. He is a graduate of the University of Montreal and won a scholarship at Johns Hopkins University, Baltimore, Md., where he obtained his diploma in public health in 1936.

Lt.-Col. H. M. Elder, of Montreal, has been confirmed in routine orders of the Canadian Active Service Force, as commanding officer of the 9th Field Ambulance, Royal Canadian Army Medical Corps, a member of the First Division, C.A.S.F.

Modern and convenient hospital service will be available to the residents of the Chateauguay Valley after the formal opening of the Barrie Memorial Hospital at Ormstown, Que., by Dr. J. C. Moore, of Huntingdon, which took place on December 2nd.

The collection of $38,000 has enabled the institution to start fully equipped and debt-free. The project began with a bequest of $11,000 from the late Miss Margaret Barrie, who left the residue of her estate for the purpose of starting a hospital at Ormstown. About $22,000 was raised by private subscription and the Quebec Provincial Government gave a grant of $5,000. The Neil Sangster property, formerly the Thomas Baird property, was acquired for $5,000 and the building was transformed into a smart, modern, fully-equipped hospital.

The provisional governors of the hospital are: R. E. Walsh, chairman; H. B. Patton, secretary; Dr. James Quinton, Dr. M. R. Stalker and George E. Baird. They worked to obtain the hospital's charter. Auguste Boyer, K.C., also helped obtain the charter. Later, with the aid of Donald E. Black, M.P., and Mr. Boyer, the hospital was accepted as a recognized public institution, enabling it to receive and care for indigent patients as provided under the Quebec Public Charities Act.

Saskatchewan

At the November meeting of the Regina and District Medical Society W. A. Riddell, Ph.D., Provincial Analyst spoke on "Vitamins". He described the extraction of vitamins from fish. Before coming to Regina he was associated with the Fisheries Board at Prince Rupert.

Dr. D. S. Gorrell, son of Dr. A. S. Gorrell who recently retired on account of ill health, has begun practice with Dr. E. A. McCusker, Dr. H. M. Graham and Dr. T. J. Haughton. Dr. Gorrell has just completed three years' post-graduate work in the Royal Victoria Hospital, Montreal, where he was a former resident house surgeon in Ophthalmology. He will confine his practice to the specialty of eye, ear, nose and throat.

LILLIAN A. CHASE

General

The American officers of the **International Congress of Pædiatrics** have decided that the international situation is such at the present time that it seems advisable to postpone to an indefinite date the Fifth Congress which was scheduled to be held in Boston, Mass., U.S.A., September 3, 4 and 5, 1940.

Professor W. W. Chipman, of Montreal, has been admitted to Honorary Fellowship in the Royal College of Obstetrics and Gynæcology. Two other Canadians were admitted to Membership, A. W. Andison and R. Lyons.

The present war is reminding us only too clearly of the problems in the last war. The history of No. 1 Canadian General Hospital by Colonel Kenneth Cameron is therefore very timely (see advertisement on p. 107. The book was published last year, but it has hardly received the attention it deserves as a record of a fine Canadian hospital.

It is obvious now that the present war is presenting problems rather different to those of 1914-18. But there will always be the demand for steady hard work, well done. This is what Colonel Cameron's history tells us about. It is a record to be proud of, and should be in the hands of all those who are interested in history and Canadian achievements.

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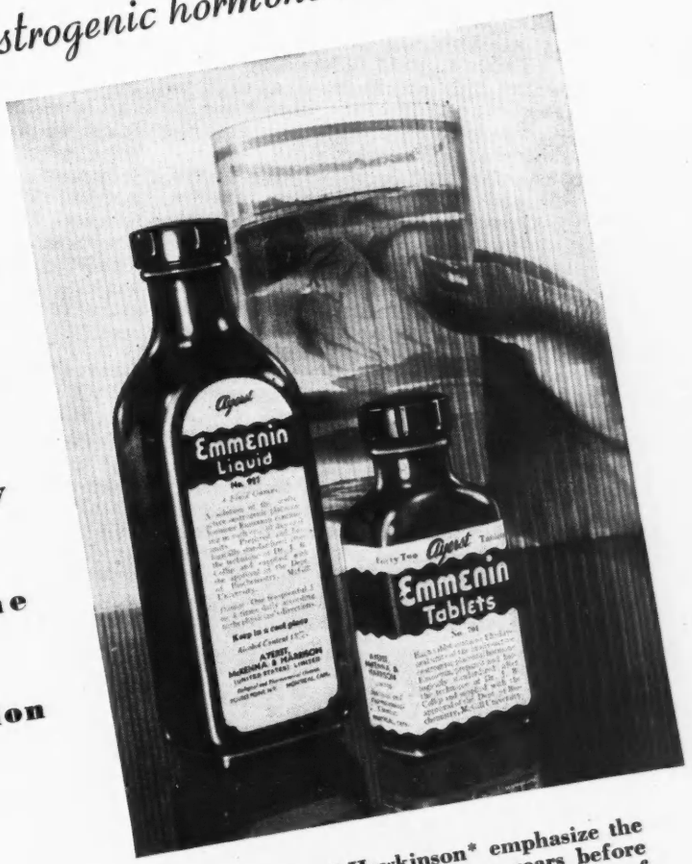

Menopausal Symptoms: Clinical reports such as that of Hawkinson* emphasize the fact that symptoms which are climacteric in nature may occur months or even years before the actual menopause is evident. As Hawkinson has stated, oral therapy in the form of "Emmenin" is of definite value for patients in the early menopause who are still menstruating. It is suggested that "Emmenin" be administered early—even before menstruation actually ceases. Later in the course of the menopausal syndrome, in patients who have not had this prophylactic treatment of "Emmenin", "Estrobene" orally or "Estrobene D.P." parenterally may be administered in order to bring the symptoms under control with the least possible delay. Once having obtained this desired effect, "Emmenin", because of its freedom from any untoward effect and because of the feeling of well-being which follows its continued use, is most valuable for maintaining the therapeutic effect over a period of months or even years—as may be necessary before a gradual physiological readjustment can take place.

*Hawkinson, L. F.: J.A.M.A. 111:390 (July 30) 1938.

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Book Reviews

Pulmonary Tuberculosis. G. Kayne, W. Pagel and L. O'Shaughnessy. 565 pp., illust. $12.75. McAinsh, Toronto, 1939.

Dr. Kayne points out in his preface that much fruitful research work has been carried out in recent years on various aspects of tuberculosis, but that the results of such work need to be well digested before they find a place in the textbooks. This volume is an attempt to present the various aspects of pulmonary tuberculosis in a connected account of recent work and views, but pointing out problems which still require solution.

The collaboration of a pathologist working in the field of tuberculosis and a thoracic surgeon provides sound authorship covering a wide field. It is a work for the general physician who wishes to acquaint himself with the modern knowledge regarding pulmonary tuberculosis, the treatment of which has undergone radical change in recent years. It is not burdened with details of symptoms, physical signs, and methods of physical examination, in which the reader is presumed to have been instructed; yet diagnosis receives full discussion, and the management of the case, a term preferred to that of treatment, is well outlined.

In the section on pathology the chapter on the evolution of tuberculosis in man gives a masterly picture of our present conception of infection and its methods of spread within the body. Clinical, laboratory and x-ray methods of investigation in diagnosis and prognosis are exceedingly well presented while the management of the patient, the medical and surgical treatment of the disease, and its complications leave little to be desired. The final chapters deal with epidemiology and prevention.

The volume is highly recommended to those working in the field of tuberculosis and to the physician responsible for diagnosis, care, and after-care of this disease.

Synopsis of Pulmonary Tuberculosis. J. Segal. 150 pp., illust. $2.75. Oxford University Press, New York, 1939.

The author frankly states that he has not attempted to deal exhaustively with tuberculosis. Nor has he taken up any special aspect of it. That makes his task a very difficult one, for he does not satisfy anyone who wishes a general account, nor is it so easy to stimulate to further reading. It is quite true, as Dr. Coryllos has said in his foreword to the book, that only one with an extensive knowledge of his subject could have presented his material so well. In that case we would have liked more. The writing is certainly clear and the views sound. In referring to BCG however, it does not seem quite right to say that the Lubeck tragedy was due "to the effects of the vaccination".

Those interested in tuberculosis will note in this little book the very evident sincerity of one with long and well digested clinical experience with tuberculosis.

Angina Pectoris. H. R. Miller. 292 pp. $3.25. Williams & Wilkins, Baltimore, 1939.

This is an unusual book on a well-worn subject, yet one which deserves to be considered as a valuable contribution to a clearer understanding of that elusive symptom—chest pain. The author comments on the confusion which has resulted from the loose use of terms and thinks that it would be well in using the designation "angina pectoris" to qualify it by mentioning in each case the specific cause or pathogenesis. Thus, one might speak of angina pectoris (or anginal pain) from acute coronary occlusion (or possibly aortic disease) and restrict the term "cardiac pain" to non-anginous conditions associated, for example, with infections, poisons, metabolic disorders, or sensitizing substances. He prefers "to consider angina pectoris a paroxysmal upheaval of central origin, and this whether the individual has normal or abnormal coronary vessels." Unless otherwise indicated, the term "anginal pain" is reserved for pain arising in the heart, coronaries, aorta, and for the pain component of the angina pectoris complex associated with or free of structural alteration in these tissues. Other kinds of pain having no anginous connotation is designated as "cardiac pain".

To elucidate this difficult subject a cardinal prerequisite "is a clear understanding of the pathways that initiate, transmit and deliver cardiac pain into consciousness". To this end the author presents a progressive series of anatomical charts on cardiac innervation which tend to explain many clinical facts. These charts occupy about half the book. The remainder is taken up with what "the practical man" would consider of more importance—differential diagnosis and treatment. We have chapters on The Simulation of Anginal Pain and of Angina Pectoris; The Non-Surgical Treatment of Angina Pectoris; The Surgical Treatment of Anginal Pain and of Angina Pectoris; The Physiology and Psychology of Pain. All of these subjects are dealt with helpfully in the light of the scientific background. We commend the book without reserve.

Heart-sounds in Normal and Pathological Conditions. O. Orias and E. Braun-Menendez. 258 pp., illust. $4.50. McAinsh, Toronto, 1939.

For the first time a textbook has appeared dealing specifically with the graphic registration of the heart-sounds. While this publication will interest mainly physiologists and cardiologists it forms a valuable addition to medical literature.

The opening chapter deals with the historical aspects of the subject. The succeeding chapters deal with the physics and physiology of the heart-sounds, auscultation, and with the various phonocardiographic methods. The value of the direct or mechanical method of registration is compared with that of the indirect or electrical method. The many excellent records throughout the book have been prepared by the authors, using the direct method. Among the various types of electrical amplifiers the Cambridge Instrument Company's stethograph, which has recently become popular in the United States and Canada, is described.

The normal first, second, and third heart-sounds are amply discussed. The superior value of the jugular pulse record as a reference tracing is stressed, whereas most authors have heretofore used electrocardiograms only, for reference. The majority of the phonocardiograms contained in this text are fortunately accompanied by both jugular tracings and electrocardiograms. In future, this should materially assist in the interpretation of phonocardiograms where an electrocardiogram alone is available for reference.

An interesting chapter deals with auricular heart-sounds, the recognition of which is customarily overlooked. The various types of gallop rhythm are clearly and convincingly explained in a separate chapter.

Hypertension and Nephritis. Edited by A. M. Fishberg. 4th ed., 761 pp., illust. $7.50. Lea & Febiger, Phila., 1939.

The fourth edition of this well known book has been thoroughly revised. It remains one of the best books on the subject, both for the student, practitioner, and specialist. Many of the chapters have been largely re-written and a new chapter on azotæmia added. Recent developments on the surgical treatment of essential hypertension have been discussed. Amongst the additions and alterations to the new edition are: prerenal azotæmia, the differentiation of glomerular and tubular elements in renal failure, clearance tests, the plasma proteins in the nephrotic syndrome, the Addis count, mercurial diuretics, Goldblatt's experimental production of hypertension, the mechanism and pathogenesis of hypertension, the pathogenesis and treatment of hypertensive encephalopathy, papillœdema in hypertension, the nephrotic syndrome in diabetes, hæmoglobinuric nephrosis, the treatment of œdema with acacia and concentrated

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blood serum, Masugi's experimental production of glomerulo-nephritis, skeletal changes in renal insufficiency, the Cushing syndrome, etc.

One of the commendable features of this book of immense detail and abundant references is the realization that the practitioner is called upon to treat the large majority of patients with hypertension and renal disease. For this reason the author has emphasized the clinical features and the simpler tests from which adequate information can be obtained. Treatment has also been simplified to a great extent, particularly the phase dealing with dietetic measures. This is a book well deserving of the medical man's book-shelf.

The Endocrine Glands. M. A. Goldzieher. 916 pp., illust. $10.00. Appleton-Century, New York, 1939.

Those familiar with the author's previous volume "Practical Endocrinology", 2nd edition, 1937, will find that with the same endeavour he utilizes the recent advances in the field of physiology and pathology for practical purposes and the diagnosis and treatment of the endocrine disorders, but on a much broader basis and in a more systematic manner. The morphology, physiology and morbid anatomy being clearly treated, the author presents a new detailed classification of the endocrinopathies and discusses the prevalent methods of diagnosis and treatment, with emphasis on his personal experiences in a manner worthy of comment. This volume discusses with equal thoroughness both the theoretical and practical aspects of endocrinology. It is exceedingly well written, clearly illustrated, and should serve as an excellent reference on this important subject.

The Practice of Allergy. W. T. Vaughan. 1082 pp., illust. $13.50. McAinsh, Toronto, 1939.

In some ways a small book on allergy is preferable to a large one. The picture is clearer and salient points are more easily grasped. But there always comes the time when one wants a large book of reference on the subject. Here is one such. It is as comprehensive as one could wish, and it is written by one with wide experience. The chapters on pollens and fungus allergy are greatly aided by the many excellent illustrations. Some of the others might have been left out. The information on testing is very complete and is of great practical value, as is also the chapter on miscellaneous information for food allergies. One would have liked a little more discussion on the treatment of that nightmare, severe asthma. As an all-round up-to-date book this can be recommended.

Infections of the Hand. P. Clarkson, 2nd ed., 168 pp., illust. 9s. H. K. Lewis, London, 1939.

Patrick Clarkson, staff demonstrator at Guy's Hospital, London, has done a useful bit of work in his second edition offering of the late Lionel Fifield's book on "Infections of the Hand". Amongst the additions there is a splendid chapter on Restoration of Function, approached from the economic usability of a hand rather than its anatomical set-up.

Chapters dealing with various lesions will repay intensive study. While laboured in places, particularly in the anatomy chapter, the book has a completeness, and is obviously founded on a large experience of the conditions and complications which often accompany hand infection.

Simple line drawings make the writer's point clear, and the entire layout from the opening section on anatomy through the different types of infection, and finally treatment in general and the insurance aspects and prognosis of his subject matter, has produced a compact book which will be found handy in any medical library.

Synopsis of Surgical Anatomy. A. L. McGregor. 664 pp., illust. $5.25. Macmillan, Toronto, 1939.

There are many surgical anatomies; this is one of the most interesting. Anatomy is considered from the clinical field in pathological and in physiological states. In a manner this book is mainly anatomy, yet the physiological value is stressed as of major importance, this, after all, is what the physician and surgeon find to be their particular need.

This is the fourth edition, with one reprint since 1932, which shows more graphically than any words can state its reception in the field of medical literature. For those, graduate or undergraduate, who have not read his previous editions there is here a wealth of information of practical value which is easy to read and to assimilate; for those who have seen this book there are additional topics such as the ectopic testes, the newer conception of intestinal rotation, and other details which are only to be found in current literature, particularly of the English and Scandinavian medical worlds. Most of the material contained in this book can only be found in textbooks of anatomy, in the dissecting-room, in the clinic and in the writings of many surgeons. It is advised that each medical student use it as collateral reading at his studies.

Surgical Applied Anatomy. F. Treves. 10th ed. revised by L. Rogers. 711 pp., illust. $4.50. Lea & Febiger, Phila., 1939.

The change to the Birmingham revision of anatomical nomenclature and the changes in importance of certain anatomical configurations brought to notice by newer operative procedures have warranted the revision of this "classic". The original plan of the book has been followed with changes such as necessary to conform to present day needs. The author has retained the valuable features.

Diagnosis and Management of Diseases of the Biliary Tract. R. F. Carter, C. H. Greene and J. R. Twiss, 422 pp., illust. $6.50. Lea & Febiger, Phila., 1939.

This is a compilation from the Clinic for Biliary Diseases of the New York Post-graduate Medical School with experience gained therein during the past 10 years and from the follow-up on 3,986 post-operative cases during the past twenty years.

The information has been successfully divided into 5 parts. These are: (1) practical considerations concerning etiological factors in disorders of the biliary tract; (2) diagnostic investigation of the patient; (3) medical treatment; (4) surgical management and (5) results of operative experience in general hospital service. An extensive bibliography is appended. The cholesterol, fat, proten, and carbohydrate values of the various foods in common use are given.

To review a book of this scope does not do justice nor is it of value to those most interested in the case of the abdominal surgeon, but to state a few of the conclusions may be helpful to the general practitioner who probably bears as much of the burden of judgment as to when to recommend operation. The best results are obtained in acute cholescystitis in operation within 4 days of onset; in chronics, within 2 years of onset. The most unfavourable results are obtained in acute superimposed on chronics, in jaundice, in those with a previous history of acute attacks who come improperly prepared to the operating room, as well as those with dyskinesia. In acute cholecystitis, cholecystectomy is superior to cholecystostomy.

Operative Orthopedics. W. C. Campbell. 1154 pp., illust. $13.50. McAinsh, Toronto, 1939.

Here is a presentation of orthopædic affections and their treatment by open surgery.

Development, growth and function as manifestations of physiology and pathology of the locomotory system are given prominence. Special attention is given to elective orthopædic surgical technique as being more exacting than general surgical technique because of the necessity of preventing excessive mesodermal-healing reaction and the readiness and gravity of bone infection. Apparatus which prevents and corrects deformities, which maintains position and enforces rest, and which aids in the restoration of func-

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tion is outlined and exemplified on these principles. Campbell follows the system of defining motion in joints as being from the neutral position when parallel with the long axis of the body in antero-posterior and lateral planes; the neutral position is 180 degrees. Incisions as surgical approaches to bones and joints are discussed at some considerable length and exactness, and they are the most recent modifications. The author mentions particularly the advantages of his medial approach to the elbow joint with resection of the medial epicondyle. He enters fully into the open surgery of fractures, dislocations, arthrodesis and arthroplasty. On the whole this is a good book on orthopædic surgery; it will be of value to many and particularly to the industrial surgeon.

Royal Northern Operative Surgery. Ed. by Sir Lancelot Barrington-Ward. 534 pp., illust. £2.2.0. H. K. Lewis, London, 1939.

This volume which has been contributed by the surgical staff of the Royal Northern group of hospitals covers the entire field of operative surgery which is their practice at the present time. The value of the book is largely in the inclusion of the standard methods given; it is of post-graduate instruction value. Of course, the work of many of the contributors has the value of their original work, although no mention is made as to which contributors have compiled the individual chapters. The only parts of operative technique which are omitted are those of the cranium, brain and ear, nose and throat. This volume will find a place on the book-shelves of many.

The Surgery of Pain. R. Leriche. Trans. and ed. by A. Young. 512 pp., illust. $6.50. Macmillan, Toronto, 1939.

This book is the translation of a series of lectures by the author in which he surveys the etiology and treatment of pain throughout the body. The outstanding feature is the author's faith in the cure of pain by interfering with the sympathetic nervous system by novocaine injection or sympathectomy. Supporting his own opinions with references to the physiological work of François Franck, the author attributes to the sympathetic nervous system a greater influence upon pain than do his English and American confrères. The clinical evidence presented in this book does not appear to the reviewer to support adequately the author's conclusions as to the function of the sympathetic nervous system and its rôle in the production of somatic pain. Most surgeons in North America will be in entire agreement with the futility of local neurotomies in the majority of painful conditions of the limbs, but few will agree that cordotomy is not a very worthwhile operation to relieve pain. This book is recommended to the critical attention of those specially interested in the surgery of pain.

Worth's Squint. F. B. Chavasse. 7th ed., 688 pp., illust. $7.50. Macmillan, Toronto, 1939.

This latest edition of Worth's classical work, dealing with strabismus, has been done in close consultation with the original author. In the light of the recent advances in our knowledge it was not desirable, nor was it even possible to revamp a classic.

Dr. Chavasse first takes up the development of the nerve pathways involved in the muscular coordination of the eyes. This he considers from the phylogenetic, ontogenetic and physiological points of view. Squint is then discussed as a disturbance in the development or function of these pathways. The questions of orthoptic and surgical treatment are then taken up. The necessary surgical technique is dealt with in detail. The volume ends with an appendix composed of a large number of detailed case-reports. All in all, the book affords profitable reading. The subject is treated from a new aspect with results of great value.

The only criticism that may be made is that the peculiarities of the author's style make the book difficult reading. He tends to use long and complicated sentences—with interjections. Here and there he falls into the colloquial jargon of the laboratory, which does not make things easier for the non-laboratory man. Many of his discussions of the development of the reflexes (*e.g.*, on p. 35) are dealt with teleologically and hence are open to argument. There are few bibliographic references. The result is that many of the discussions seem to lack authority. But these are only small matters in comparison with the great merit of the book.

Otolaryngology in General Practice. L. G. Richards. 352 pp., illust. $6.00. Macmillan, Toronto, 1939.

The aim of the author, as set out in the preface, is to write a book for the general practitioner in medicine specially to aid him in differentiating between those conditions in which he can reasonably be expected to take charge of the treatment and those which unquestionably fall within the domain of the specialist.

The reviewer feels that the book can be recommended to the general practitioner who will find in it the answer to many of his problems. It should certainly be a source of comfort to him to have a work of this kind at his elbow when the inevitable question arises "What should be done now?" The sections on treatment are excellent and happily lack the vagueness too often met with. Above all, the book is very readable, so much so that it will interest also the specialist, although not primarily intended for him.

Treatment of Rheumatism in General Practice. W. S. C. Copeman. 3rd ed., 276 pp. $3.00. Macmillan, Toronto, 1939.

The third edition of this work will find added favour because of the new chapters on gout, focal sepsis, and methods of treatment which have been improved the last two years. The book is well written and will be most useful to the general practitioner and student.

Nitrous Oxide-oxygen Anæsthesia. F. W. Clement. 268 pp., illust. $4.00. Lea & Febiger, Phila., 1939.

This book as its sub-title explains represents the McKesson-Clement viewpoint and technique. Any treatise on the subject of nitrous oxide anæsthesia emanating from Toledo, Ohio, the recognized Mecca of "pure gas" anæsthetists, must be approached with considerable respect. The late Dr. E. I. McKesson and the author have developed apparatus and techniques to deal with nearly every conceivable operation. The non-toxicity of nitrous oxide is emphasized, and the wide range of its applicability pointed out, which is salutory in these days of constant experimenting with new drugs and gases which may not always have the inherent safety of nitrous oxide.

Clear directions are given for employing any specialized technique with nitrous oxide and the well-known "secondary saturation" receives a satisfactory treatment and defence of its apparently alarming features. If one reads the text with some slight reservations as to the advisability of extending the use of nitrous oxide to include all types of surgery, it will give him the best single exposition on the subject yet written.

The book closes with a chapter by the late Dr. McKesson which deals with the development of the modern gas machine and endeavours to establish the marked advantages possessed by the intermittent flow type of machine over the various models of continuous flow machines. This book represents a complete and masterly study of the whole subject of nitrous oxide anæsthesia.

Heparin. J. E. Jorpes. 86 pp. $2.25. McAinsh, Toronto, 1939.

This short book contains the history of the discovery of heparin and the establishment of its chemical composition. The story begins with the work of Howell, continues with the investigations of the

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Toronto group, and is completed by the researches of the Stockholm workers.

There is a chapter on the mode of action of Heparin and another on the site of its formation in the Ehrlich "Mast cells". The strength and dosage is fully covered and the final chapters deal with the use of this new preparation in the biochemical laboratory, in experimental surgery, and, finally, in clinical practice.

This is not only a complete and accurate monograph, but an entertaining history of the growth of a new subject in scientific medicine, with Canadians playing a prominent part.

The Physiology of Exercise. J. H. McCurdy and L. A. Larson. 3rd ed., 349 pp., illust. $3.75. Lea & Febiger, Phila., 1939.

The authors of this book have compiled a great deal of information upon the effects of exercise in general body function and also the effects of certain specialized sports, such as running, swimming, football and gymnastics. The chapter devoted to aviation is incomplete and not entirely accurate as to blood findings. The third part of the book stresses tests of body efficiency and the physiology of training. There is a very large bibliography with each section, and the McCurdy-Larson test is discussed at length, with tables of figures.

This book is a decided contribution to a field of medicine which has been dealt with in the past by none too scientific methods. Physicians, coaches, trainers and those interested in organized sports could avail themselves of a great deal of the information in this book.

Uterus Masculinus. J. A. L. Magee. 95 pp. 5s. H. K. Lewis, London, 1939.

The theme of this interesting essay of Dr. Magee's would appear to be that the uterus is not regarded as being sufficiently represented in the male, and it is his opinion that the prostate should be regarded as its homologue. He points out that the other parts of the female genitalia, both internal and external, have their homologues in the male, even the mammary glands being represented. He argues that, therefore, something more tangible than the uterus masculinus must be present in the male, and, because of its position, structure and consistency, that the prostate should be so regarded. Position is surely not an important consideration. Because testes do not appear on the surface in some animals does not deny their existence.

The argument as regards structure also presents difficulties because the glandular portions of the prostate, which are its greater part, are not similar to the glands of the endometrium, and they do not open into the uterus masculinus. Moreover, they are known to rise as outgrowths from the wall of the urethra. Pathologically, the common tumours of the prostate are adenomata, while those of the uterus are myomata. The essay is written in a pleasing manner, but would appear to be the statement of an hypothesis rather than the demonstration of a proved fact.

Priests of Lucina. P. Findley. 435 pp. $5.00. Little, Brown, Boston, 1939.

This is the latest in an ever lengthening list of works devoted to the history of our calling. It is the first in English to tell the story of obstetrics. It is, therefore welcome. No one can be said to be completely equipped as a medical practitioner who does not know something, indeed much, of the path along which our predecessors have travelled. "Priests of Lucina" is wide in scope. The principal figures are dealt with not only as obstetricians but as men, and against the background of their times. The author carries us on from almost pre-historic times, when obstetrics, and, indeed, all of medical practice, was a matter of magic and superstition, until now, when, it is hardly too much to say, it has been transformed from a mere craft to a science. All the notable figures are dealt with at full length and many lesser ones get their meed of praise. The first part is largely biographical in treatment, but in the second we find essays on Obstetrical Anatomy, the Midwife, Cæsarean Section, the Forceps, and Puerperal Fever. All these are admirable. That on puerperal fever is worthy of special praise.

Coming now to matters of lesser moment, we have noticed a few errors, which should be corrected in a later edition—"Potts" for "Pott", "Frothergill" for "Fothergill". We regret to find the writer giving the weight of his authority towards establishing a rather common error. A very moderate knowledge of Latin should prevent one writing "pubis" for "pubes". "Pubes" is the nominative, "pubis", the genitive. "Pubes" as subject is correct, "pubis" as subject is incorrect; "symphysis pubis (of the pubes) is correct. These criticisms are, however, only spots upon the sun. Dr. Findley's book is timely, well done, and can be cordially recommended.

Atlas of Surgical Operations. E. C. Cutler and R. Zollinger. 181 pp., illust. $8.75. Macmillan, Toronto, 1939.

This is a revival of a type of operative surgery text which has not been used in recent years. The atlas is of large size. On opposing pages there are the details of the operation which is graphically depicted on the other page. The paper is of excellent quality: the illustrations are of exact diagrammatic proportions and delineation. There is no difficulty in following the text or the diagrams. The work has been published with the express intention of giving the surgical neophyte standard procedures in a graphic manner, in order that he may be able to follow the technique of these whilst acting as assistant without having to question the operator except in the more minute details. The entire range of major surgery is covered, except that of the brain and orthopædics. Chapters are given on surgical technique, preoperative and post-operative care, and on anæsthesia. This book is entirely on the steps of operative measures which have endured and are being used today; it contains enough to give the beginner an outline of what the operator will do in the average case, and will form a grounding for his own work when he assimilates that which is given here. There is probably a mistake in the diagrams of incisions on the fingers as these are placed where they will surely cut the blood supply and will render contracture a probability. On the whole this atlas is a worthy work.

Surgery of the Eye. M. Wiener and B. Y. Alvis. 445 pp., illust. $9.50. McAinsh, Toronto, 1939.

The object of this book was to supply a handy atlas that the student and practising ophthalmologist can refer to quickly for information on the surgical correction of ocular defects and disease. The authors have succeeded admirably in their intention. The text is clear and concise, without being prolix. Every operative procedure necessary for the average ophthalmologist's armamentarium is dealt with, besides some less common ones. There are numerous illustrations which are beautifully executed. They complement the text admirably. The various operations are briefly discussed and reasons are given why one procedure in a certain set of circumstances is to be preferred to another. This is an excellent book.

Human Gastric Secretion. B. J. E. Ihre. 232 pp. $4.00. McAinsh, Toronto, 1939.

Dr. Ihre has written this monograph on work done in Dr. Berglund's Clinic in Stockholm. The book is in three parts. The first part is a summary of the present ideas regarding the normal secretion rates and quantities of hydrochloric acid, pepsin, sodium chloride, and mucus. The middle third contains the results of his very careful investigation of the gastric juice of 100 subjects, normal and pathological. The balance of the book is a set of forty tables of his quantitative results and brief protocols of each of his 100 subjects. This book should be very

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useful to the general practitioner as well as to the specialist, giving him a reliable picture of the associated gastric secretions under various conditions, and guidance in the investigation of his patients' gastric efficiency.

Rural Medicine. Proceedings of the Conference held at Cooperstown, N.Y., October 7 and 8, 1938. 268 pp. $3.50. C. C. Thomas, Springfield, Ill., 1939.

This is a publication of the papers presented and the discussion following them at a Conference on Rural Medicine. The conference was organized by the staff of the Mary Imogene Bassett Hospital with the help of an advisory committee of prominent individuals.

To those interested in the problem of medical care in its broad sense, in the rural areas, this book will prove to be a most satisfactory source of information. It will be particularly appreciated because up to the present most of the published material has had to do with urban areas, and the present volume, dealing as it does with the rural problems of health departments, school health programs, post-graduate medical education, and the economics of rural medicine, is most valuable.

Community Health Organization. Edited by I. V. Hiscock. 3rd ed., 318 pp. $2.50. Commonwealth Fund, N.Y., 1939.

Community Health Organization is a standard administrative handbook indispensable to the public health administrator and the student in public health. The third edition maintains the high standards of previous editions, brings the publication up-to-date, and presents the best current practice of public health in the United States.

Nutrition and Diet in Health and Disease. J. S. McLester. 3rd ed., 838 pp. $9.00. McAinsh, Toronto, 1939.

An analysis of man's nutritive needs in health and disease is given, and special consideration of the practical arrangement of his diet in disease is discussed in this third edition which has been entirely rewritten. The chapters on feeding of infants by Dr. P. C. Jeans and the chapter on feeding of surgical patients by Dr. Dean Lewis are useful additions. This volume is up to date and should be well received.

The Principles and Practice of Nursing. B. Harmer and V. Henderson. 4th ed., 1047 pp., illust. Macmillan, Toronto, 1939.

This well known work has now gone into a fourth revised edition. It is more than a textbook of nursing procedures for it contains a great deal of information on related subjects which make it exceedingly valuable to the nurse. This edition has been thoroughly revised to bring its arrangement and topics into conformity with the Curriculum Guide of the National League of Nursing Education. While not arranged primarily to conform with the New Curriculum developed in Canada it does meet these requirements quite well. A well-written text such as this can be recommended not only to undergraduate and graduate nurses but also to medical students, because of its wealth of important nursing lore and technique which cannot be obtained in the usually prescribed medical textbooks.

Pathogenic Micro-organisms. W. H. Park and A. W. Williams. 11th ed., 1056 pp., illust. $8.00. Lea & Febiger, Phila., 1939.

The last work of a great and useful life is the eleventh edition of Pathogenic Micro-organisms which is very well known to the student body and laboratory worker. As in the previous texts every effort has been made to incorporate the new material on the subject and make the book more useful and practical. The sections on Bacterial Variations and Metabolism of Bacteria are valuable additions. The chapter on Yeasts and Moulds has been completely rewritten and beautifully illustrated. This text will long remain a monument to its great author.

Heart Patients. S. C. Smith. 161 pp. $2.00. Lea & Febiger, Phila., 1939.

The book is announced as a source of information on heart affections for the busy physician. Written in a gracious, courtly style, vaguely reminiscent of the old "family doctor book", it will bring many a nostalgic moment to those who recall the simpler days of cardiology. Certainly, the reader will not be burdened with many of the science's more modern and difficult views. Such statements, however, as the one that syphilis of the heart can be relied upon to make a bold and definite declaration of its presence and that routine blood Wassermanns are therefore not necessary must be shouted down, no matter how rude this may seem. And to deny that quinidine has any value at any time, is hardly the best advice to give even very busy physicians.

Superfluous Hair and its Removal. A. F. Niemoeller. 155 pp. $2.00. Harvest House, New York, 1939.

Contains useful hints about removal of troublesome hair.

Short Stature and Height Increase. C. J. Gerling. 159 pp. $2.00. Harvest House, New York, 1939.

Some interesting notes on variations in stature and discussions as to correction thereof. For popular consumption.

How Life Began. D. Forsyth. 106 pp. $1.50. Macmillan, Toronto, 1939.

A speculative study in modern biology.

Primer on Allergy. W. T. Vaughan. 140 pp. $1.75. McAinsh, Toronto, 1939.

A popular presentation of what has become a really popular subject. The general directions to allergic patients are very good.

Micro-diffusion Analysis and Volumetric Error. E. J. Conway. 306 pp., illust. 25s. Crosby Lockwood & Son, London, 1939.

A laboratory manual.

BOOKS RECEIVED

Alcoholics Anonymous. 400 pp. $3.50. Works Publishing Co., New Cork, 1939.

Gastrointestinal Dysfunction. B. A. Rhinehart, 311 pp., illust. Central Printing Co., Little Rock, Ark., 1939.

The Anærobic Bacteria and Their Activities in Nature and Disease. E. McCoy and L. S. McClung. Vol. 1, Author Index; Vol. 2, Subject Index, 602 pp. University of California Press, Berkeley, 1939.

Health Officers' Manual. J. C. Geiger. 148 pp., illust. $1.75. McAinsh, Toronto, 1939.

Principles of Human Anatomy. C. F. DeGaris, E. Lachman and R. E. Chase. 239 pp. $2.50. Lea & Febiger, Phila., 1939.

Laboratory Manual of the Massachusetts General Hospital. F. T. Hunter. 3rd ed., 119 pp. $1.75. Lea & Febiger, Phila., 1939.

Pictorial Midwifery. C. Berkeley. 3rd ed., 165 pp., illust. $2.25. Macmillan, Toronto, 1939.

Cancer: Causation, Prevention and Treatment. A. E. Blackburn. 111 pp. 6s. H. K. Lewis, London, 1939.

Medical Annual. 660 pp. and index. $6.00. Macmillan, Toronto, 1939.

Manual of Toxicology. F. R. Davison. 241 pp. $2.50. P. B. Hoeber, New York, 1939.

Collected Papers by Members of the Gynæcological Department of Johns Hopkins Hospital. Vols. A and B, 1929-1938.